

From: Whittaker, Laura [laura.whittaker@aptim.com]

Sent: Friday, August 10, 2018 1:39 PM

To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]

CC: Slack, Matthew L CIV SEA 04 04N [matthew.slack@navy.mil]; Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Noble, Kimberly K CIV SEA 04, NAVSEA DET RASO [kimberly.k.noble1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Mangel, Amy [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Gerg, David [david.gerg@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]

Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY A3 (Use 11)

Attachments: HPNS APTIM RSY A3 (Use 11) Soil Non-LLRW Concurrence Request 08102018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.



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APTIM
Hunters Point Naval Shipyard
200 Fisher Avenue
San Francisco, CA 94124



Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013			
RSY Pad: A3	RSY Pad Use Number: USE 11	First Submittal <input checked="" type="checkbox"/>	Second Submittal <input type="checkbox"/>
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 08/10/2018	

Soil Sample Data						
Sample Identification	Survey Location	Type of Sample	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁶⁰ Co Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.252	0.331
PE2-RSYA3-U11-S001	1	Systematic	0.501	0.00854	-0.0415	0.00747
PE2-RSYA3-U11-S002	2	Systematic	0.600	-0.0614	0.0220	N/A
PE2-RSYA3-U11-S003	3	Systematic	0.622	-0.0408	-0.00439	N/A
PE2-RSYA3-U11-S004	4	Systematic	0.463	-0.0305	-0.0181	N/A
PE2-RSYA3-U11-S005	5	Systematic	0.407	0.000	0.0127	N/A
PE2-RSYA3-U11-S006	6	Systematic	0.755	0.0223	-0.00933	N/A
PE2-RSYA3-U11-S007	7	Systematic	0.707	0.0264	-0.0644	N/A
PE2-RSYA3-U11-S008	8	Systematic	0.792	-0.0469	0.0106	N/A
PE2-RSYA3-U11-S009	9	Systematic	0.406	-0.0119	0.0471	N/A
PE2-RSYA3-U11-S010	10	Systematic	0.415	-0.00189	0.0162	N/A
PE2-RSYA3-U11-S011	11	Systematic	0.710	0.00406	-0.0790	0.116
PE2-RSYA3-U11-S012	12	Systematic	0.521	0.0437	-0.0308	N/A
PE2-RSYA3-U11-S013	13	Systematic	0.658	0.0155	-0.0419	N/A
PE2-RSYA3-U11-S014	14	Systematic	0.562	0.00389	-0.0019	N/A
PE2-RSYA3-U11-S015	15	Systematic	0.198	-0.0279	-0.0335	N/A
PE2-RSYA3-U11-S016	16	Systematic	0.458	-0.0176	0.00356	N/A
PE2-RSYA3-U11-S017	17	Systematic	0.493	-0.0114	0.0422	N/A
PE2-RSYA3-U11-S018	18	Systematic	0.517	0.0149	0.0381	N/A

¹³⁷Cs Cesium-137
⁶⁰Co Cobalt-60
²²⁶Ra Radium-226
 Sr Strontium
 pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-07052018-PE2-ROV2-2707	07/05/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,4872 CPS	2,902-3,770 CPS
RSI Follow-up Static Survey	HPRS-07172018-PE2-JSS2-2768	07/17/2018	RS-701/RXS-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,095-4,265 ⁺ CPS
Systematic Sample Survey	HPRS-07052018-PE2-JSS-2712	07/05/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	13,395-15,129 CPM

+ Gamma readings exceeding the Reference Area 3σ IL are attributable to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil—see Note(s) in the Summary table (page 2) for more details.

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
<p>1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).</p>
<p>2) RSI Follow-up static survey—30 locations identified during the data review process were investigated, with readings less than the Reference Area static IL at all locations for regions of interest (ROIs) 3, 6, 7, 8, and 9 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).</p> <p><u>Note:</u> Gamma readings exceeding background are due to the presence of naturally-occurring non-Navy program radionuclides in the excavated soil. Count rates in all radionuclide-specific ROIs (3, 6, 7, 8, and 9) are less than the radionuclide-specific Reference Area static ILs for all follow-up investigation locations.</p>
<p>3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 42-65).</p> <p>Ten percent of the systematic soil samples (two samples in total, PE2-RSYA3-U11-S001 & PE2-RSYA3-U11-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 42-65).</p>
<p>Conclusions:</p> <p>All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 30 locations were investigated during the follow-up static survey, with readings less than the Reference Area static IL at all locations for ROIs 3, 6, 7, 8, and 9 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 9-38).</p> <p>Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 39-41). Ten percent of the systematic soil samples (two samples in total, PE2-RSYA3-U11-S001 & PE2-RSYA3-U11-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).</p> <p>RSY A3 (Use 11) contains soil from Survey Unit areas undergoing revetment construction.</p> <p>APTIM request RASO concurrence to release this soil as Non-LLRW.</p> <p>Disposition: This soil shall be dispositioned as non-LLRW waste to be stockpiled onsite following appropriate chemical characterization.</p>

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
 - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ($Z > 3$) is marked for follow-up.
 - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local $Z > 3$ is marked for follow-up.
 - **Semi-local Z-Scores:** Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local $Z > 3$ is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
 - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local $Z > 3$ is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi- local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

LC = critical level (counts)
 B = average background in the ROI

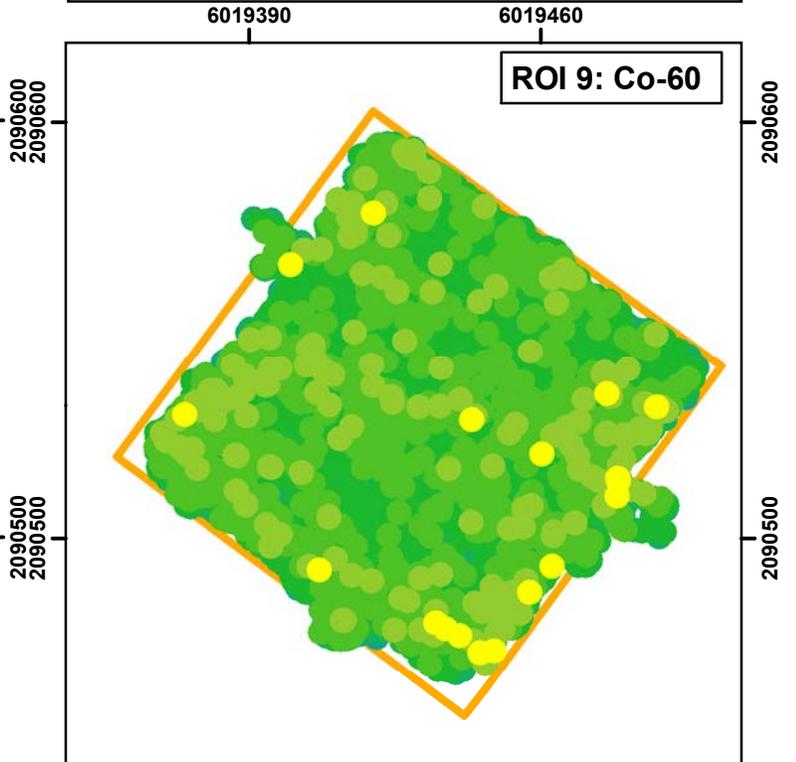
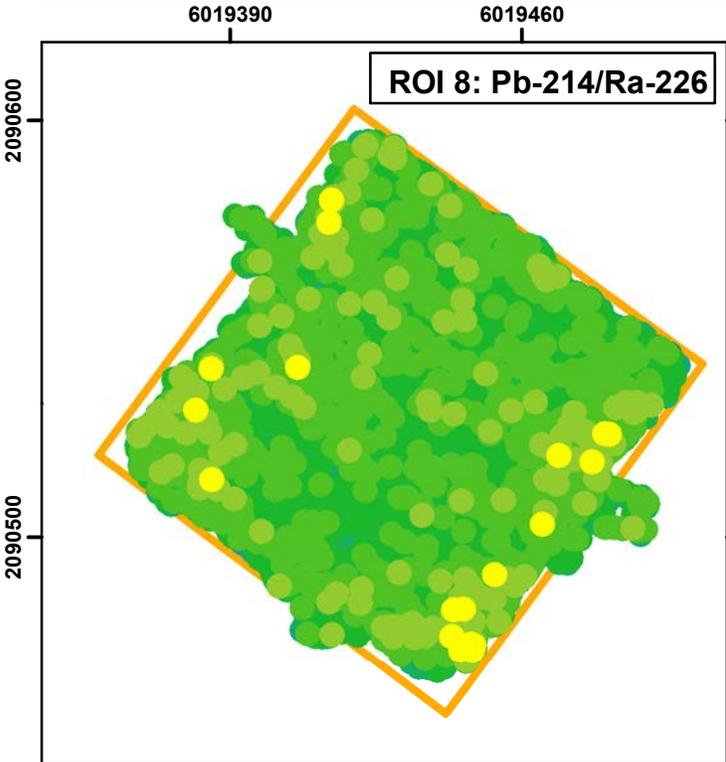
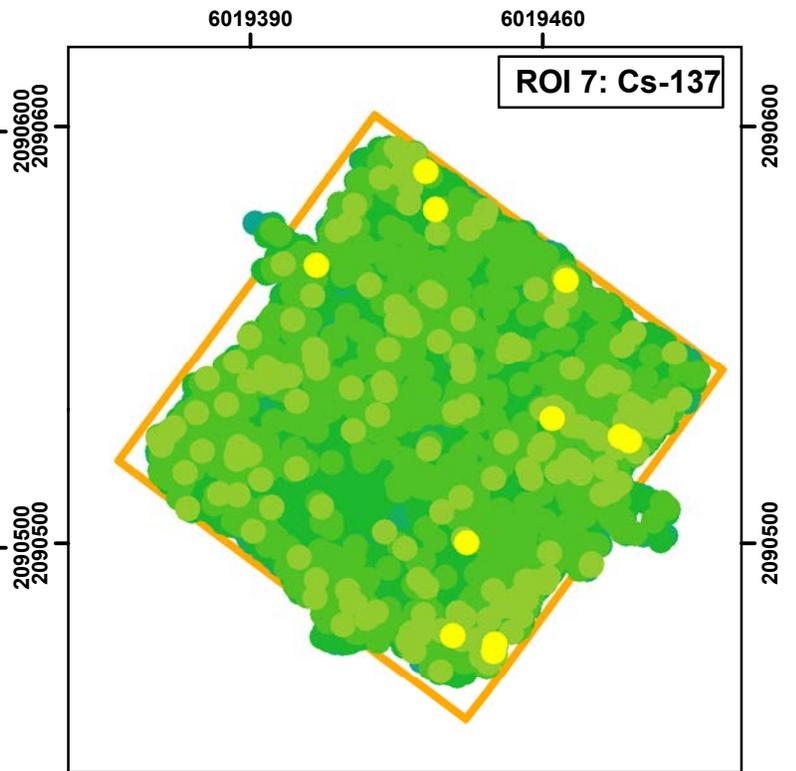
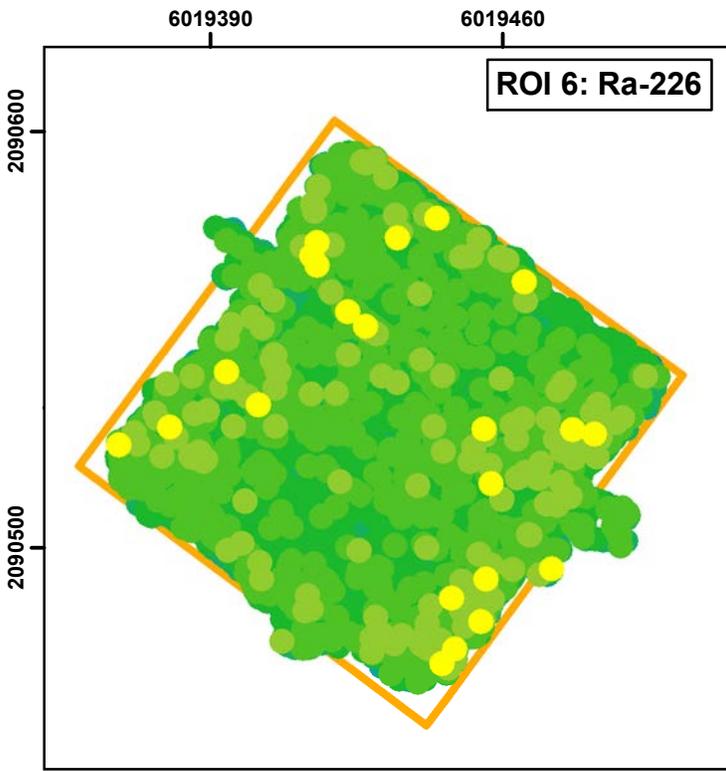
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

RSI Data Plots
 HPNS Parcel E-2
 RSY Pad A3 (Use 11)

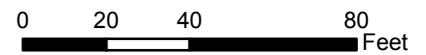
Soil Excavation Site:
 Revetment Spoils

Contour Map



RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|--|--|
| ● > 3 std dev | ● > -1 to < 0 std dev |
| ● > 2 to < 3 std dev | ● > -2 to < -1 std dev |
| ● > 1 to < 2 std dev | ● > -3 to < -2 std dev |
| ● > 0 to < 1 std dev | ● < -3 std dev |
| | RSY Pad Boundaries |



Coordinate system: CSP Zone III. NAD83, US Survey Foot



RSI Review Summary

Summary:

30 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of ^{226}Ra , ^{137}Cs , or ^{60}Co above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 9; figures are provided on pages 9-38.

HPNS Parcel E-2 RSY Pad A3 (Use 11)

6019390

6019460

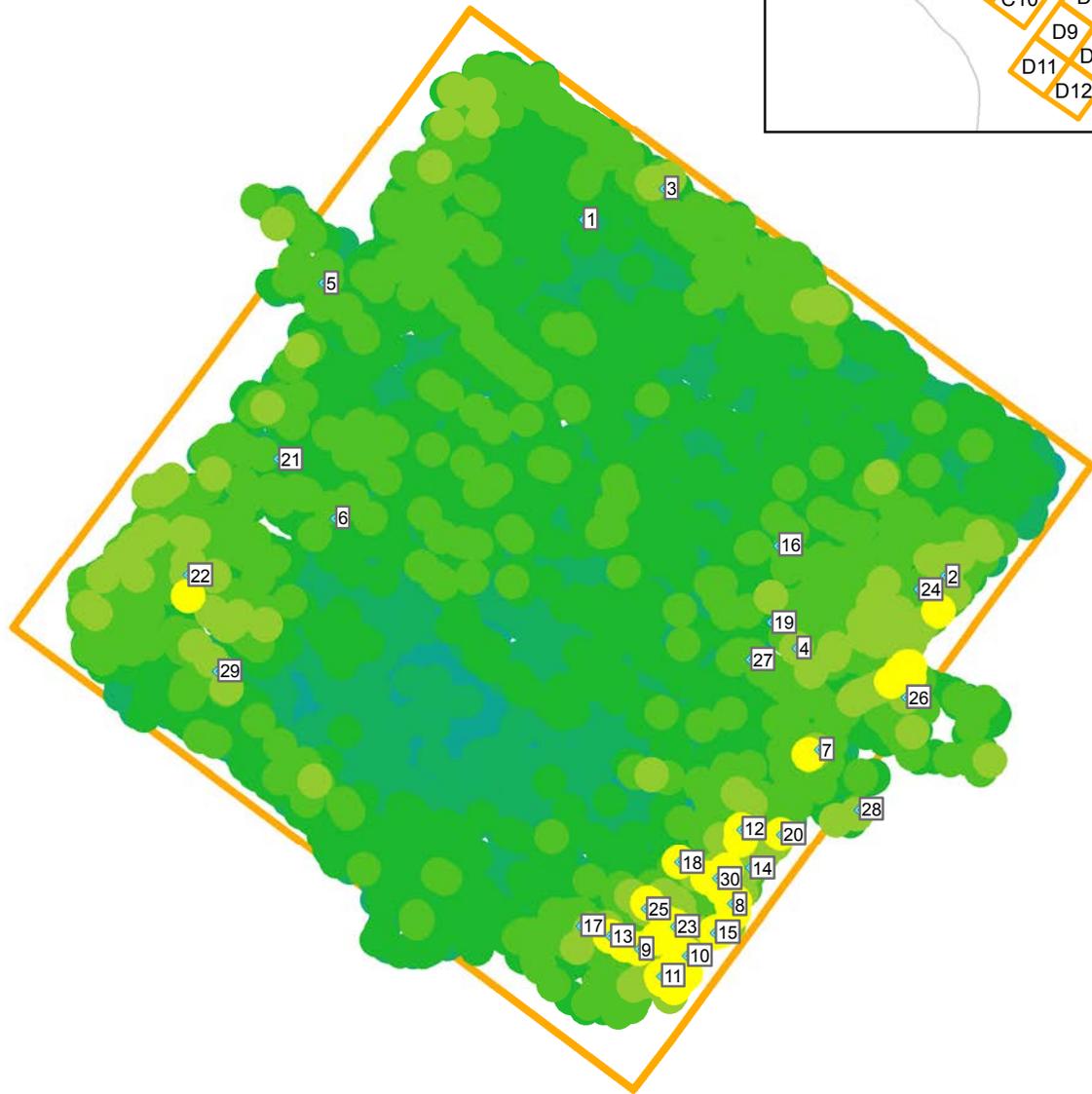
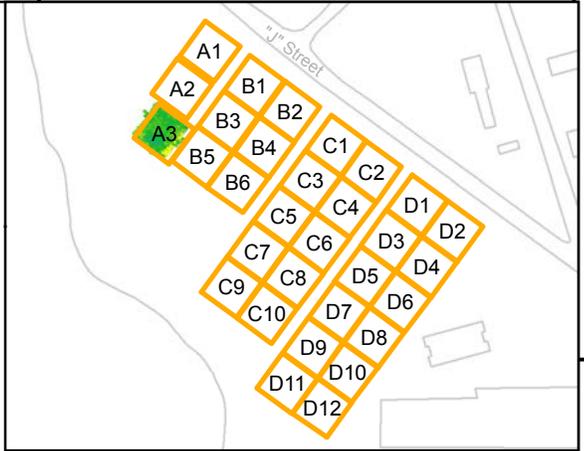
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2090600

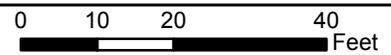
2090500

2090500



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

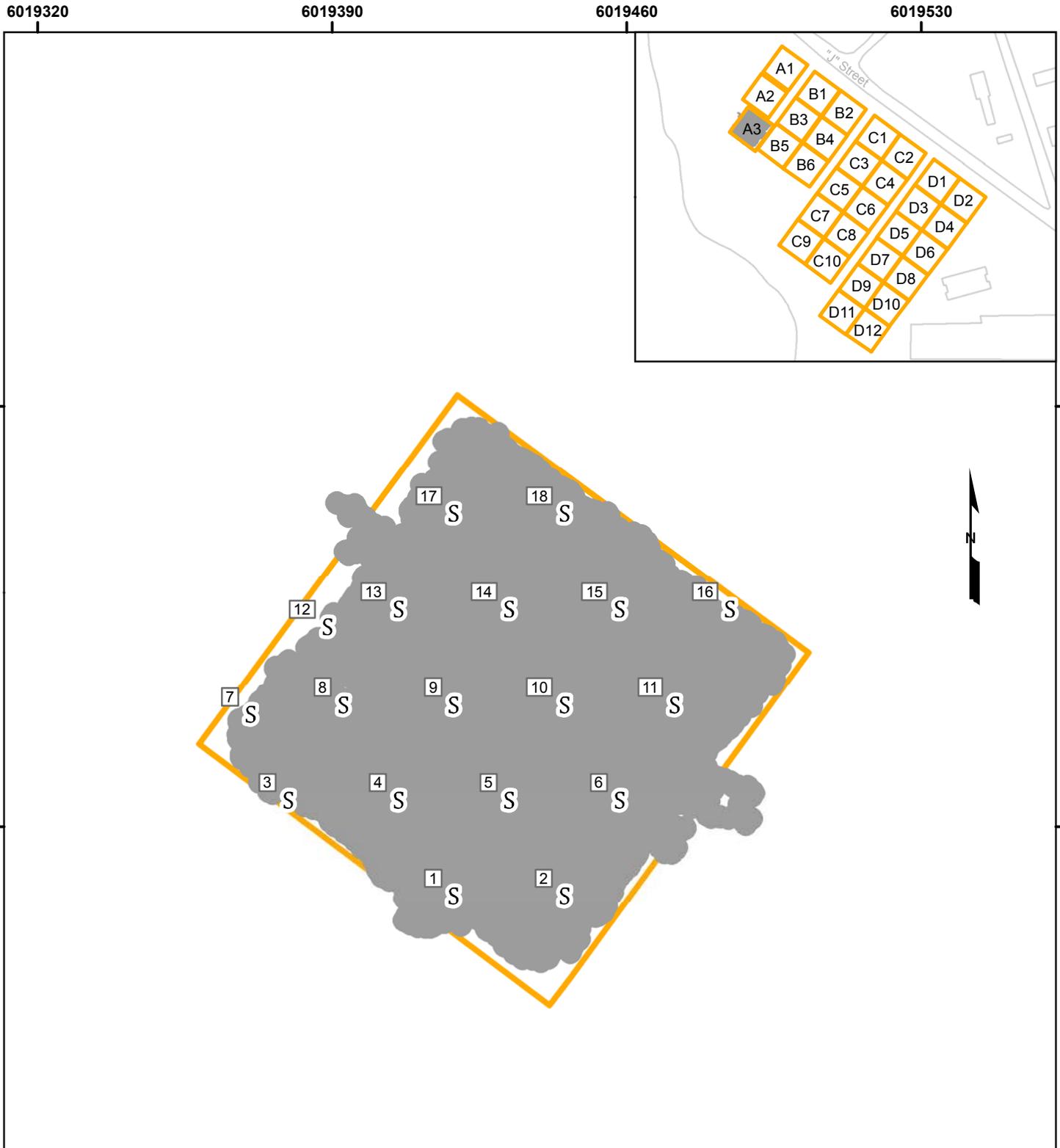
- ◆ Follow-up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev
- RSY Pad Boundaries



Coordinate system: CSP Zone III. NAD83, US Survey Foot

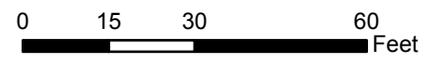


HPNS Parcel E-2 RSY Pad A3 (Use 11)



Survey Instrument: Model 2221/ 44-20
Serial Number: 271439

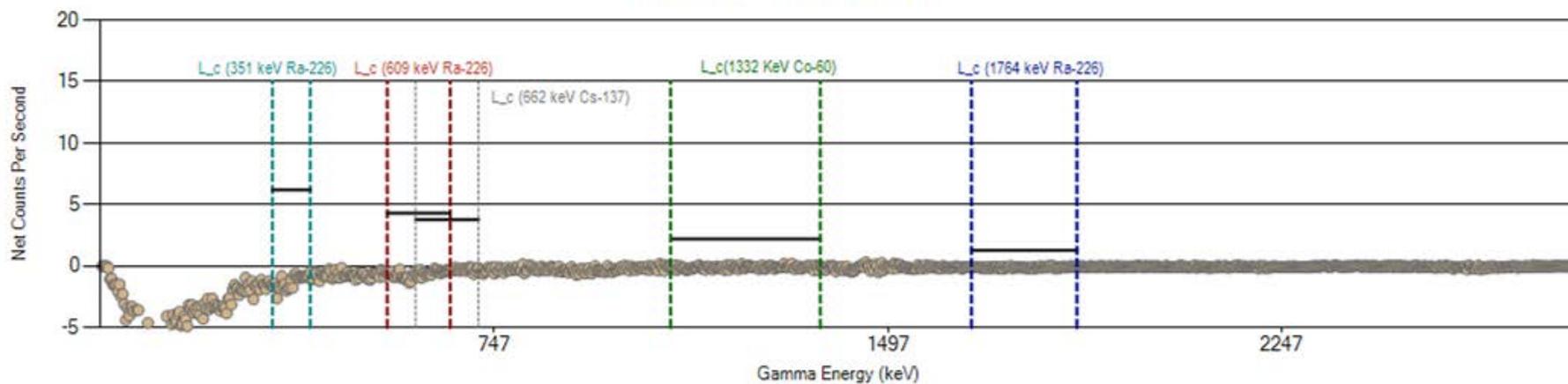
- S Systematic Sample Locations
- RS-700 GWS Coverage
- ▭ RSY Pad Boundaries



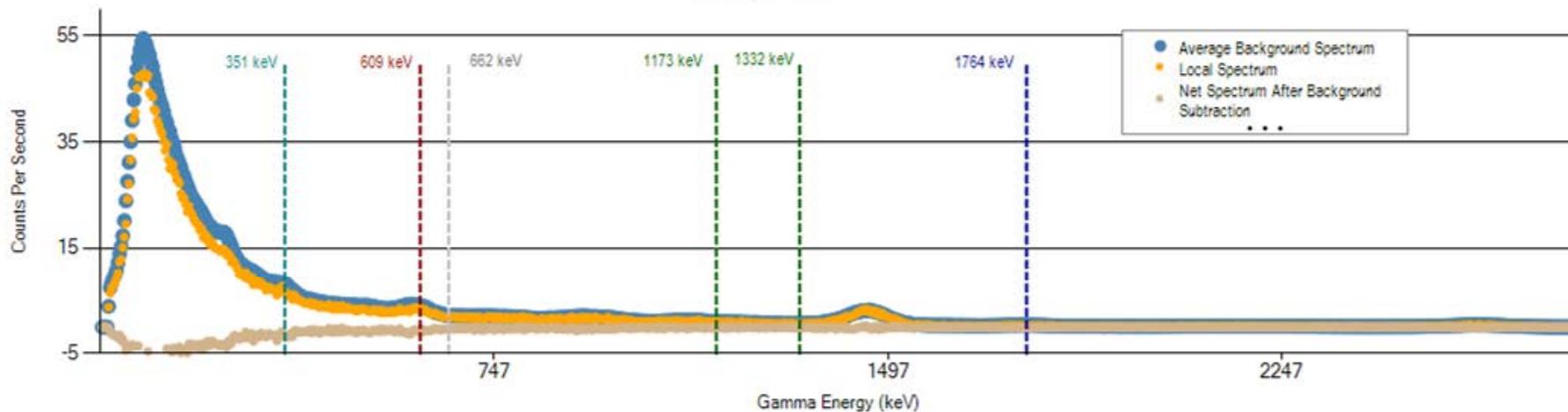
Coordinate system: CSP Zone III. NAD83, US Survey Foot



Net Gamma Spectrum at Location 1

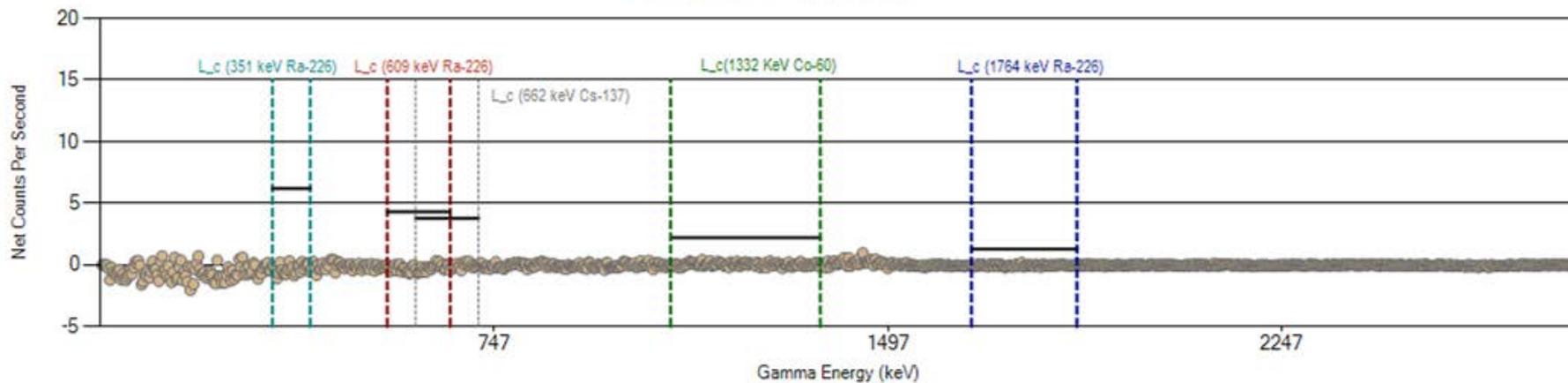


Gamma Spectra at Location 1

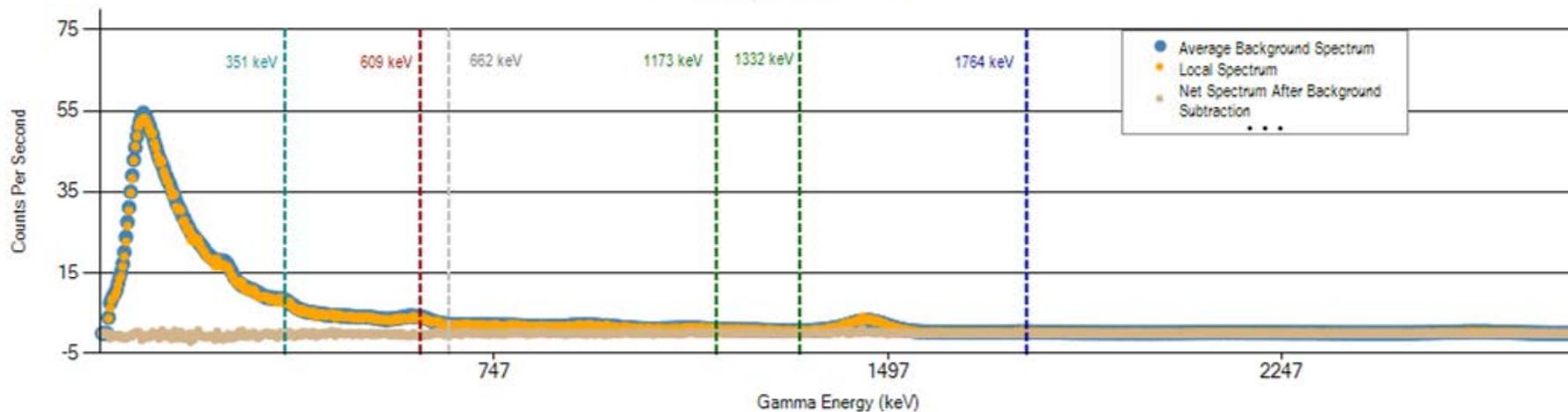


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	723	107	14	18	124	115	91	143	79	3095
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 2

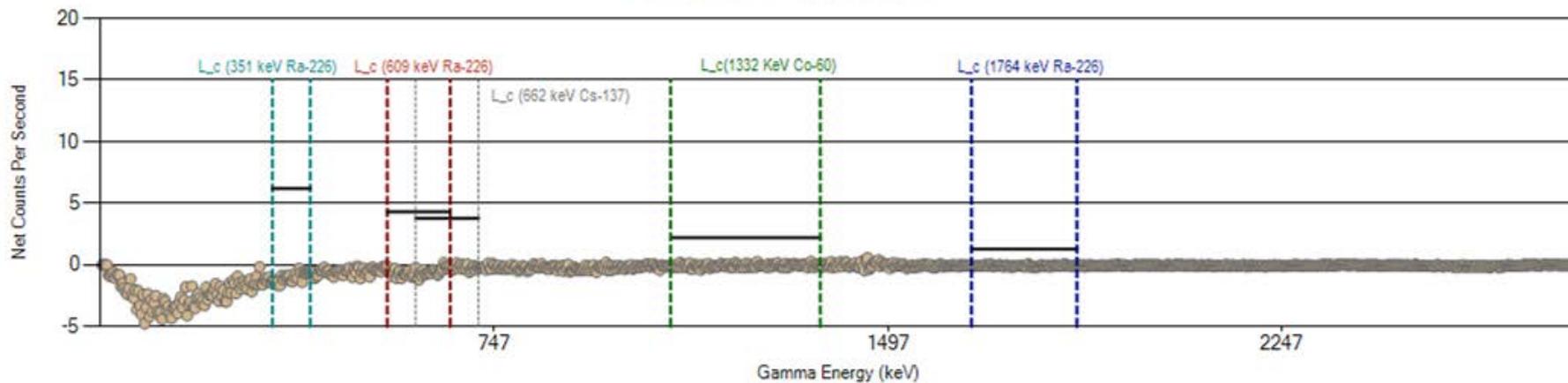


Gamma Spectra at Location 2

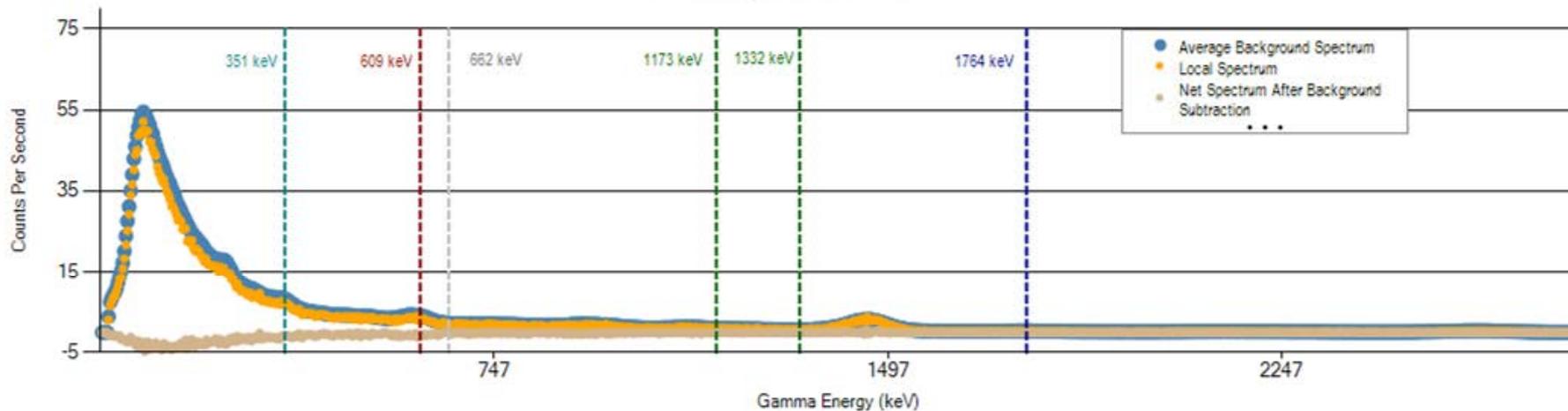


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	835	123	18	20	145	130	102	166	92	3524
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 3

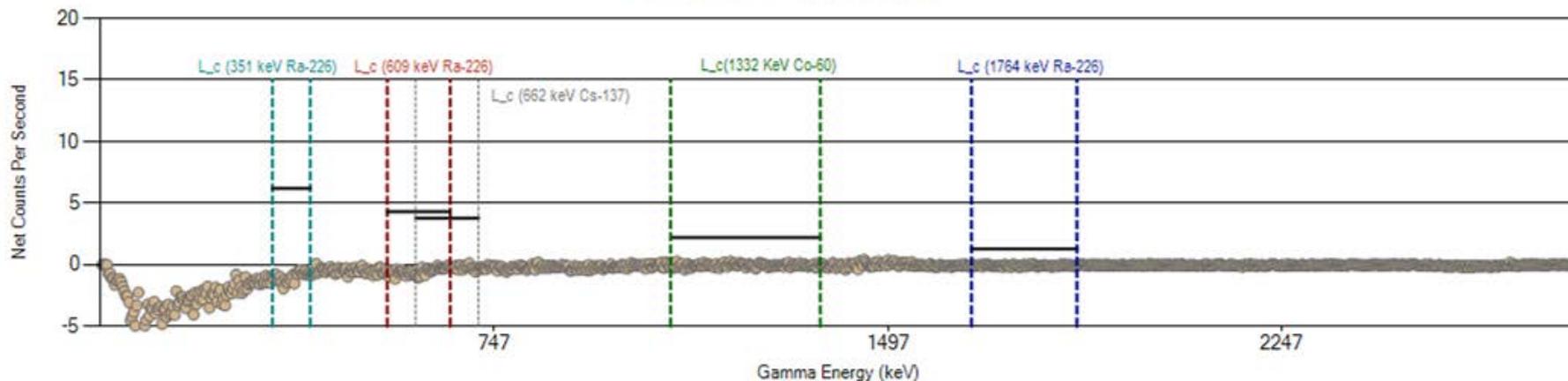


Gamma Spectra at Location 3

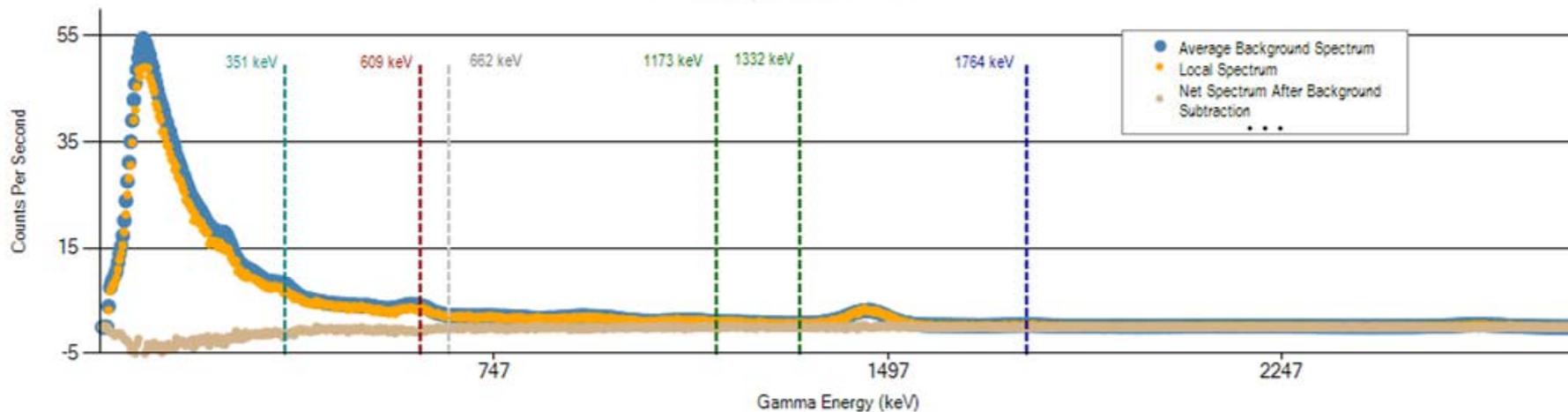


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	754	114	16	17	132	116	92	150	83	3240
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 4

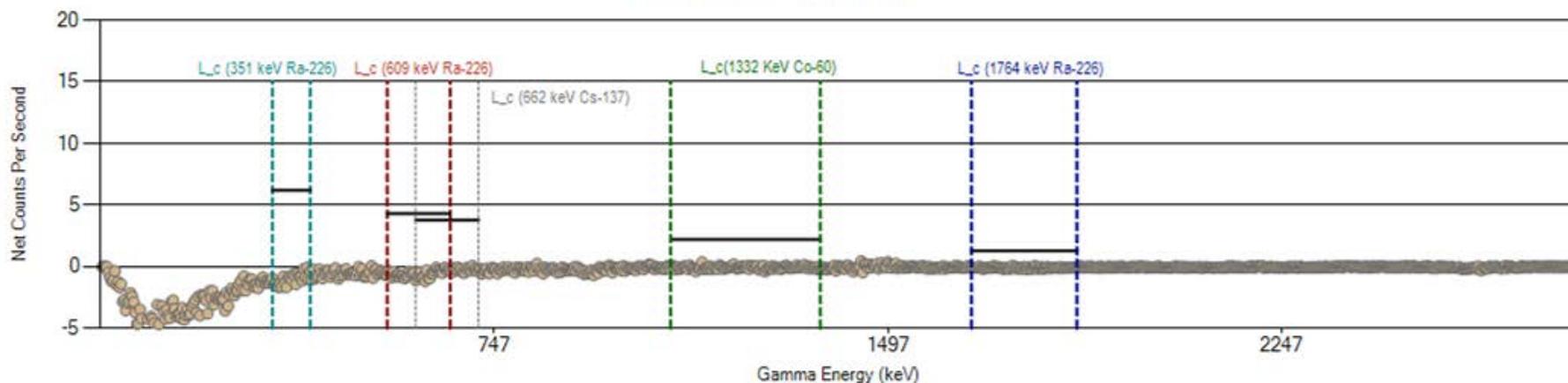


Gamma Spectra at Location 4

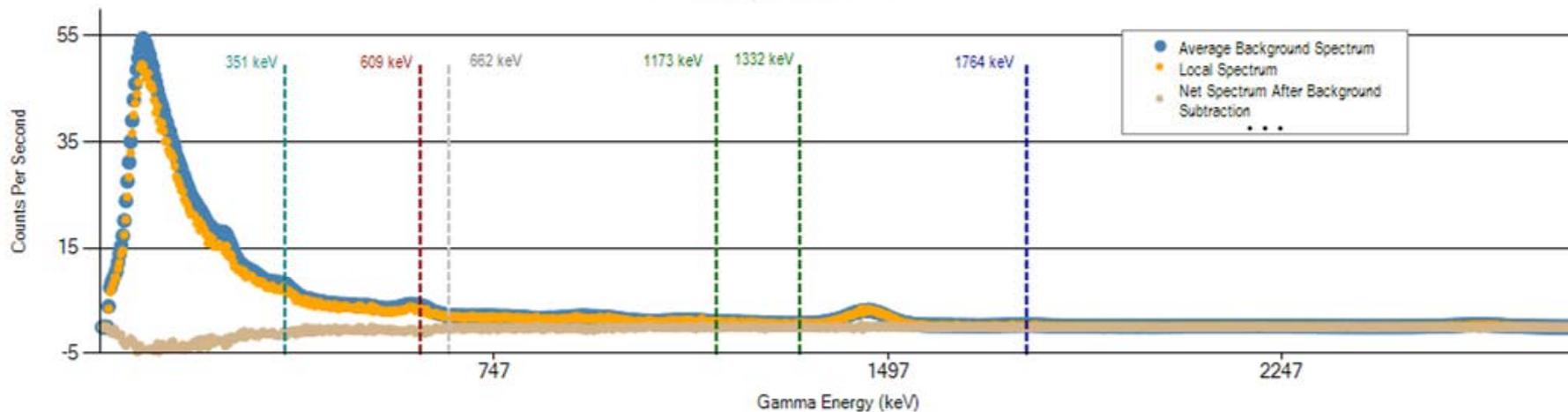


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	766	115	16	18	132	119	94	149	85	3228
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 5

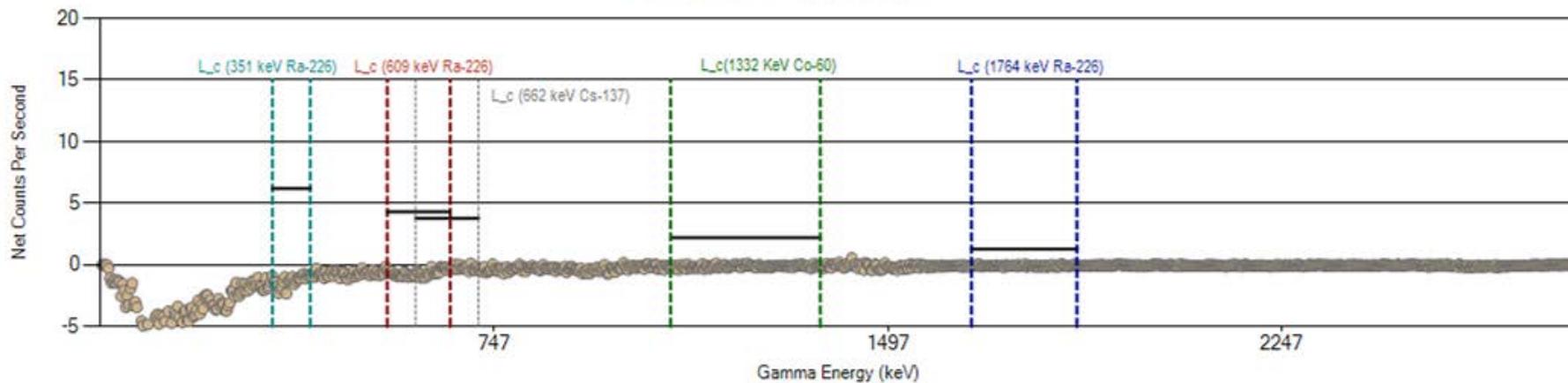


Gamma Spectra at Location 5

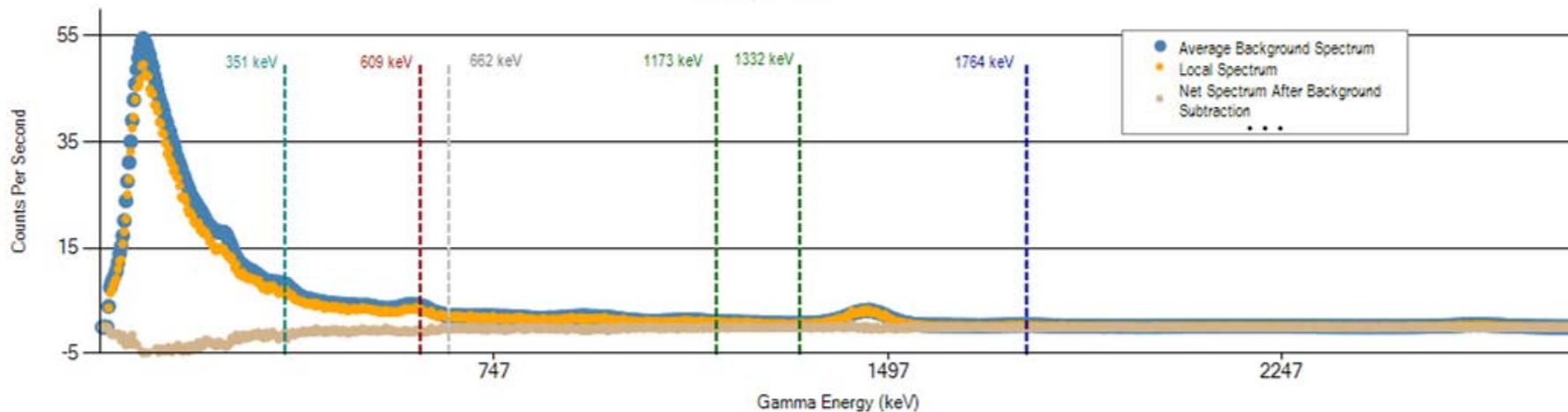


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	755	114	15	19	131	117	92	149	83	3198
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 6

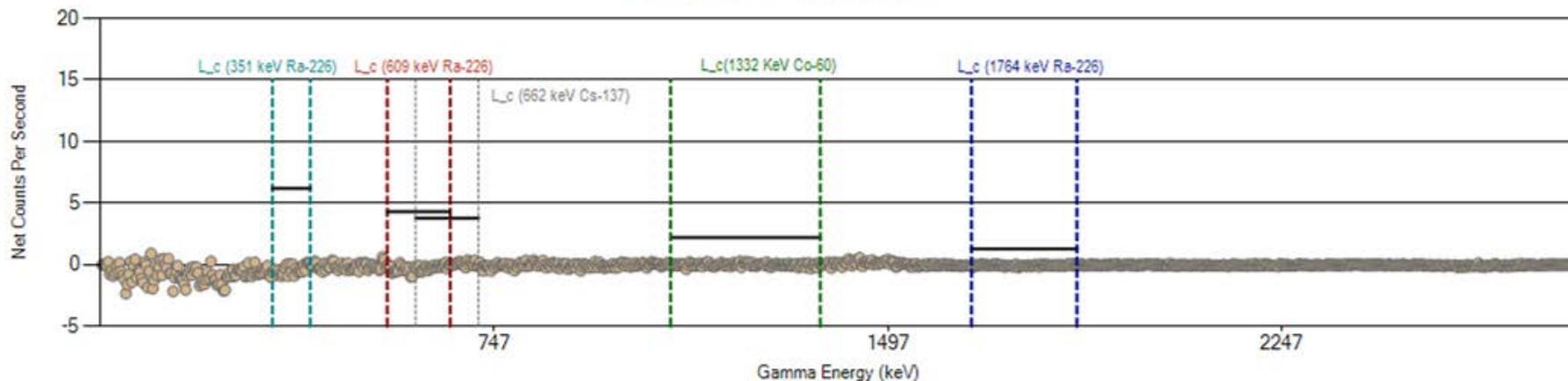


Gamma Spectra at Location 6

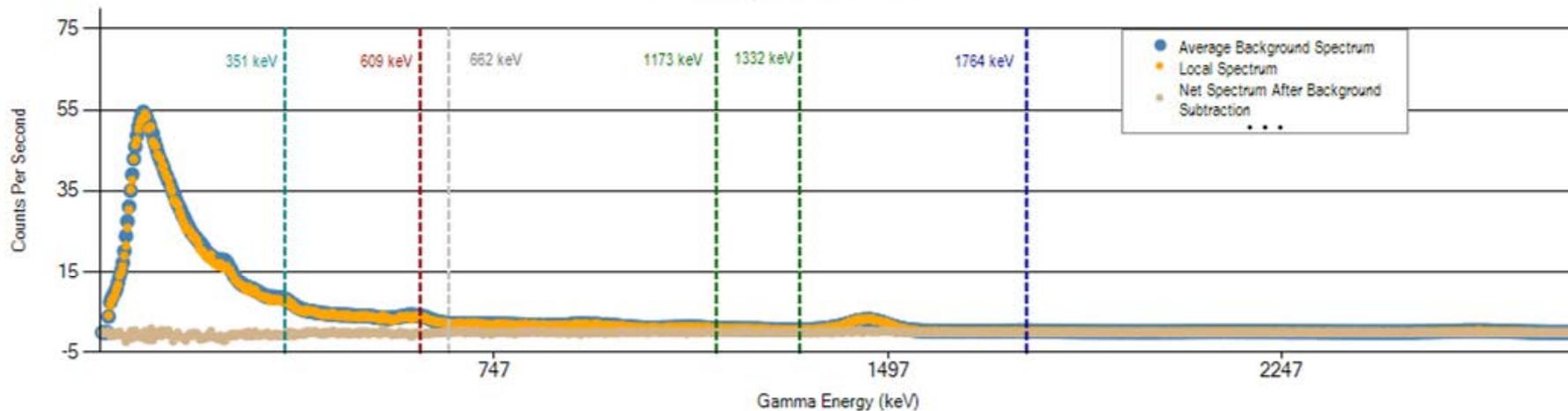


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	718	108	16	18	124	114	91	142	78	3115
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 7

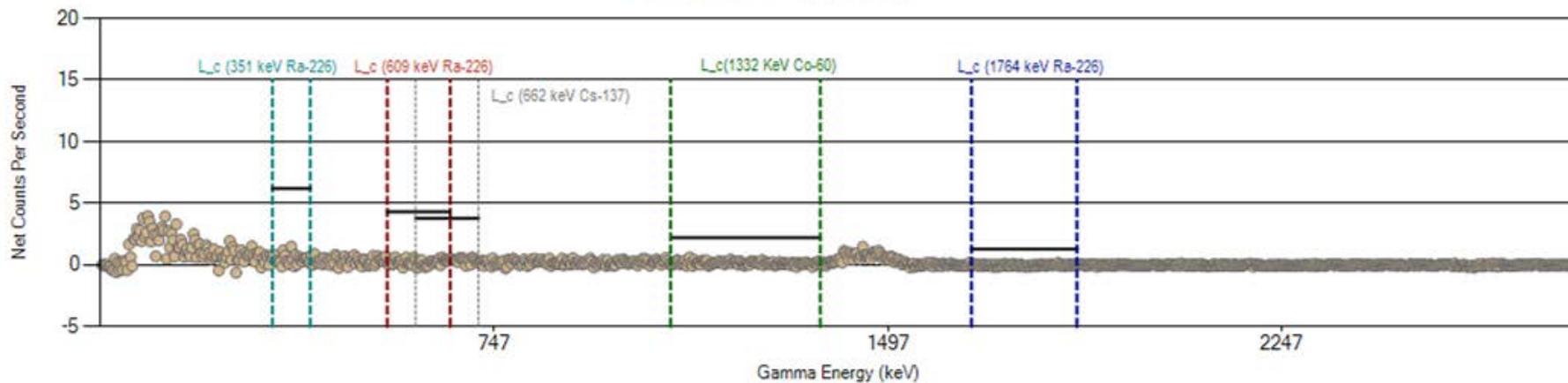


Gamma Spectra at Location 7

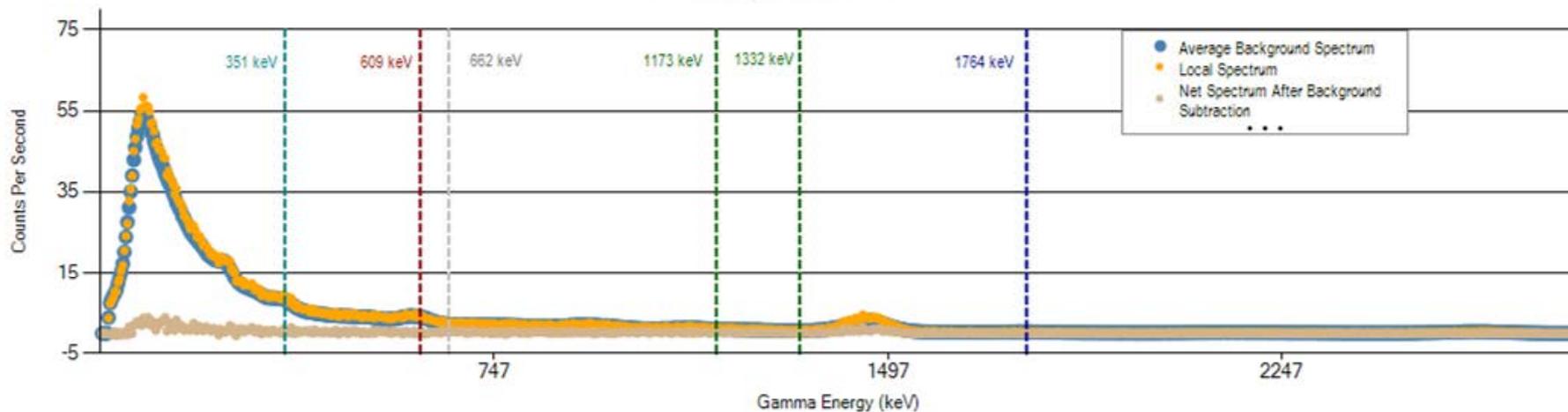


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	830	122	17	19	145	130	105	165	90	3501
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

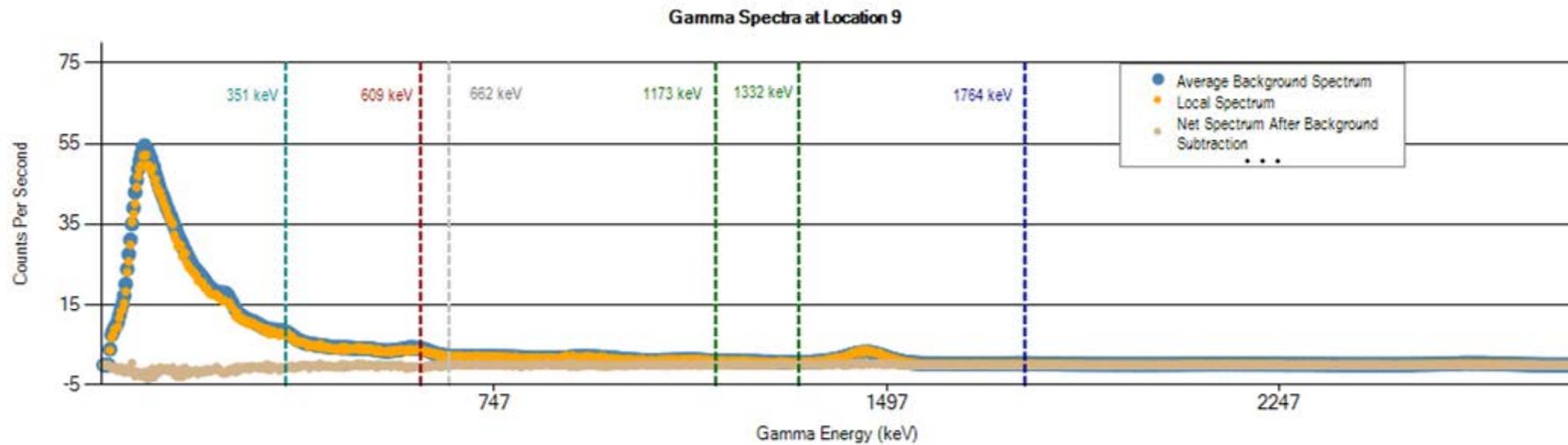
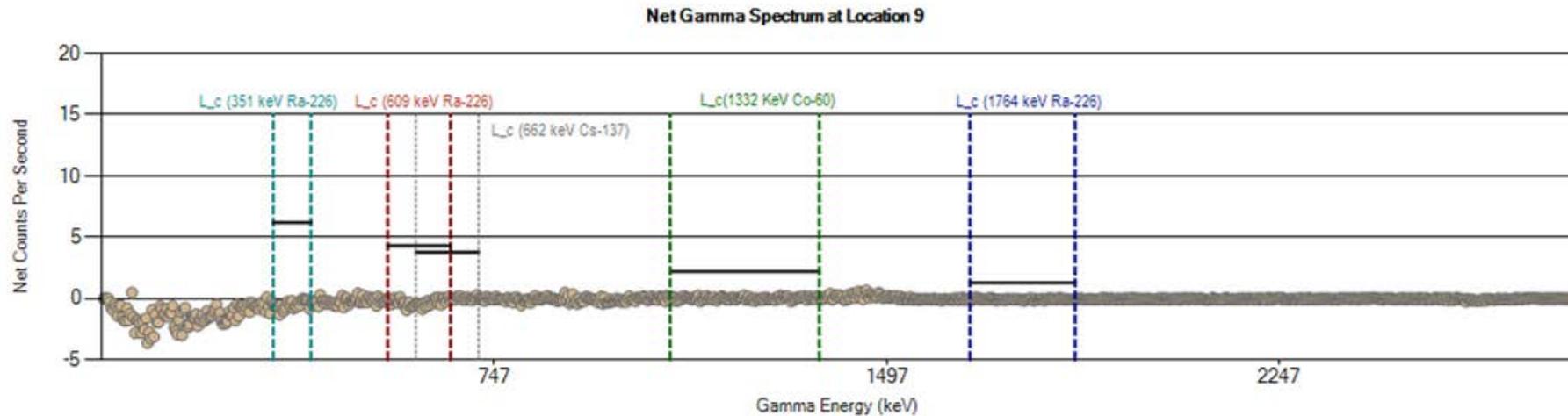
Net Gamma Spectrum at Location 8



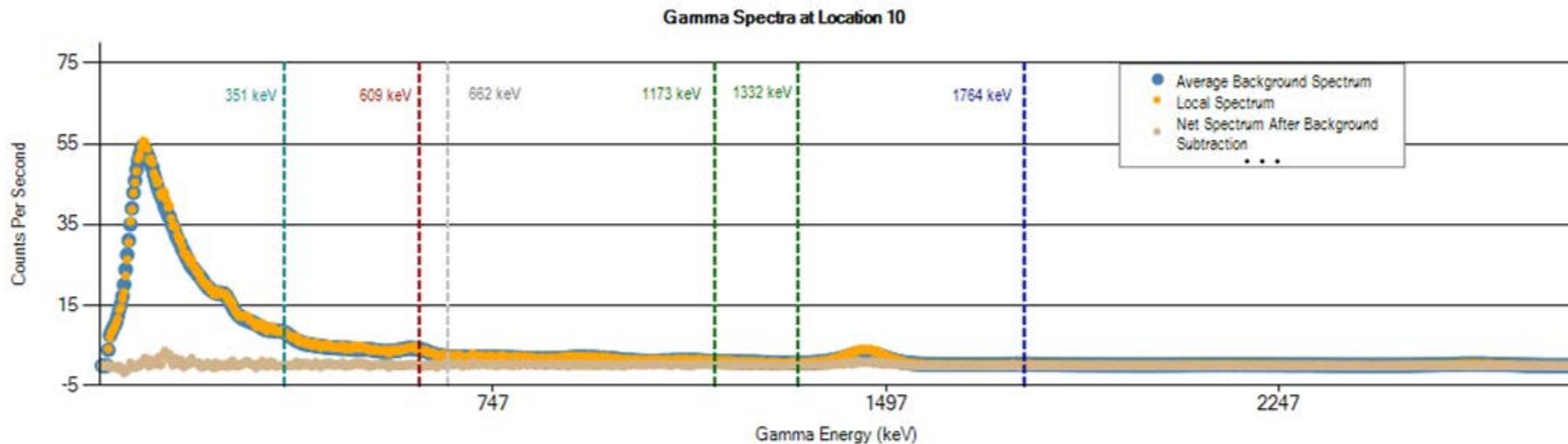
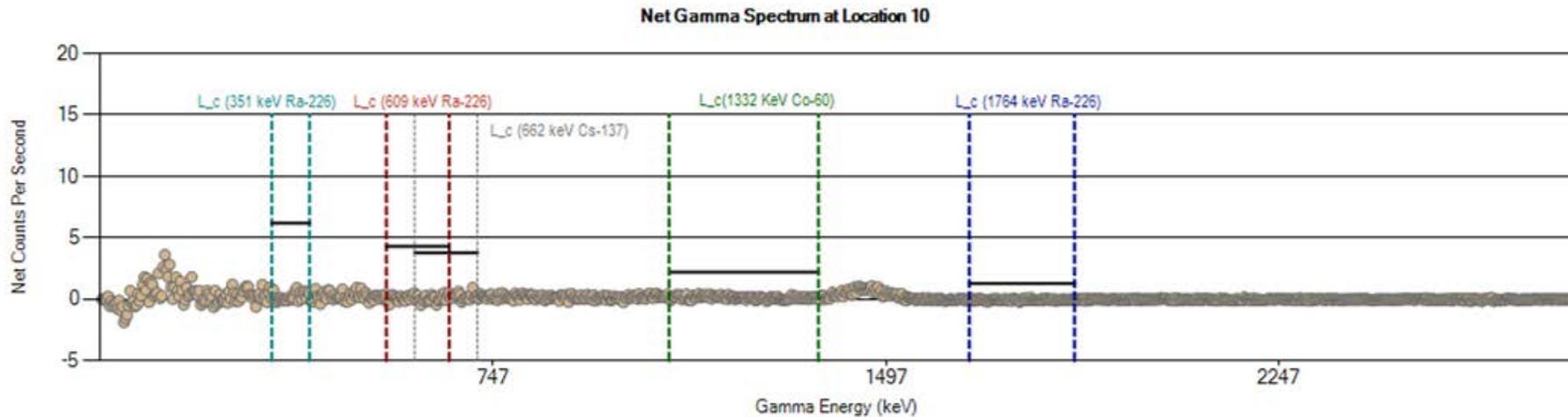
Gamma Spectra at Location 8



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	951	145	19	23	164	150	119	186	103	3844
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

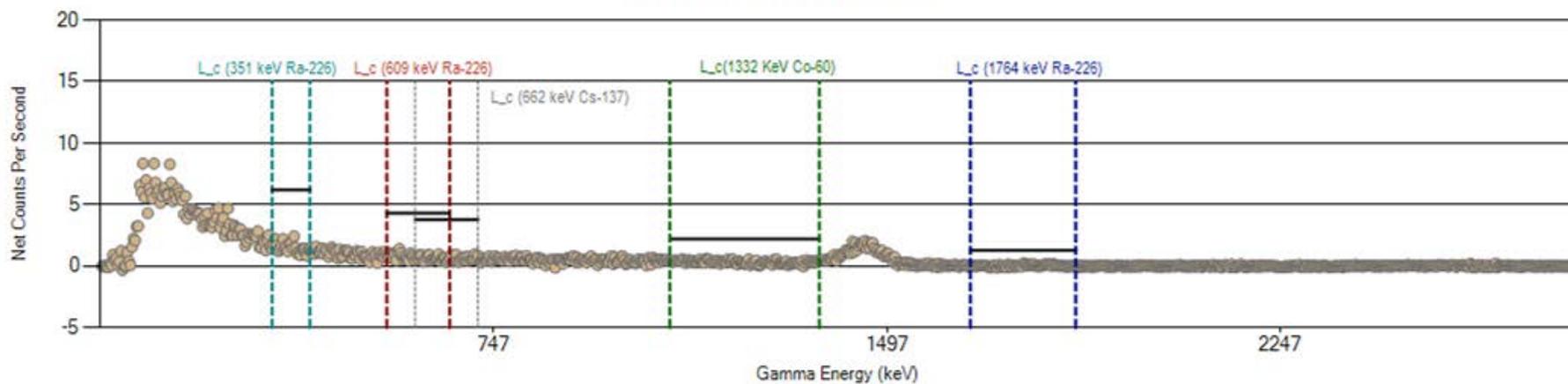


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	823	123	17	20	146	128	102	161	91	3427
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

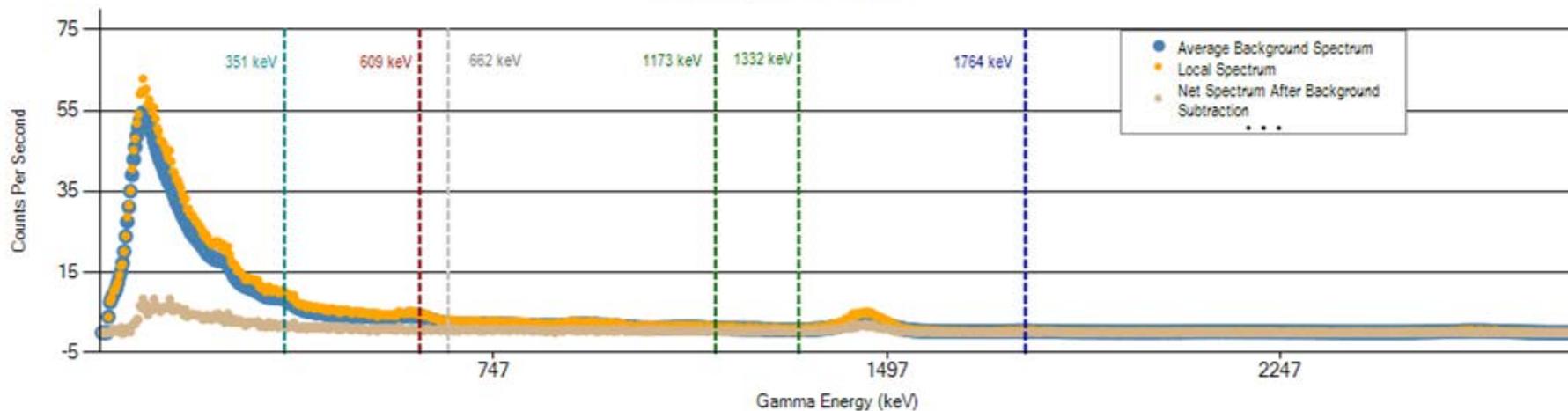


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	930	142	18	23	159	144	113	179	102	3732
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 11

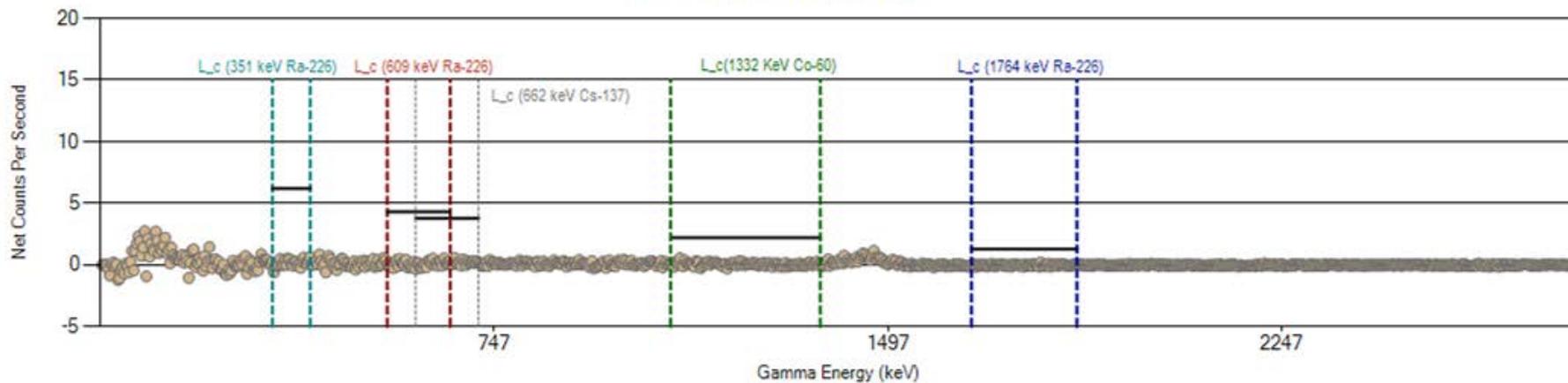


Gamma Spectra at Location 11

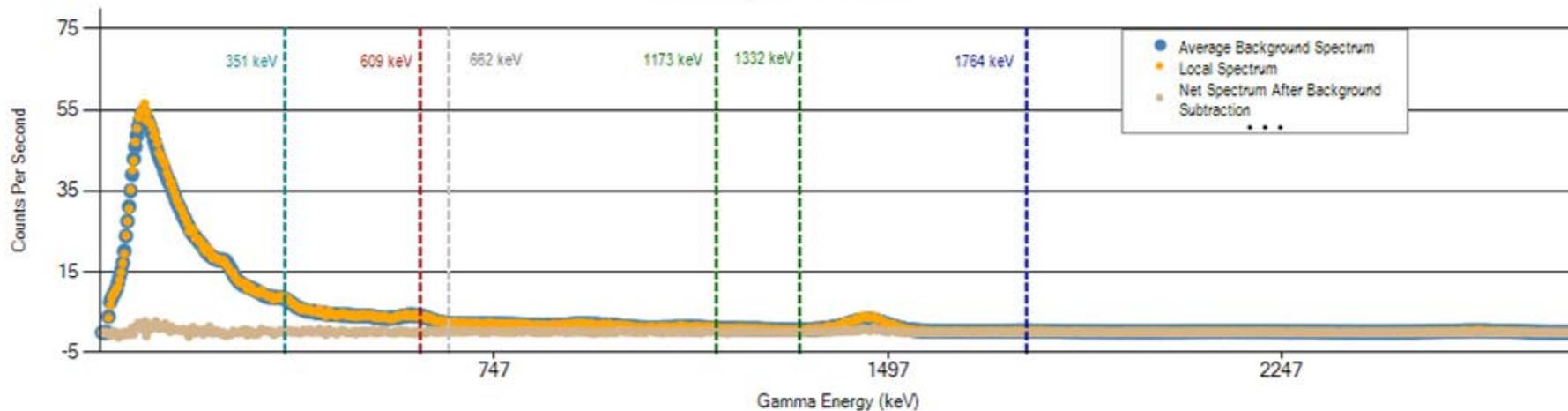


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	1096	171	23	27	187	170	133	212	120	4265
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

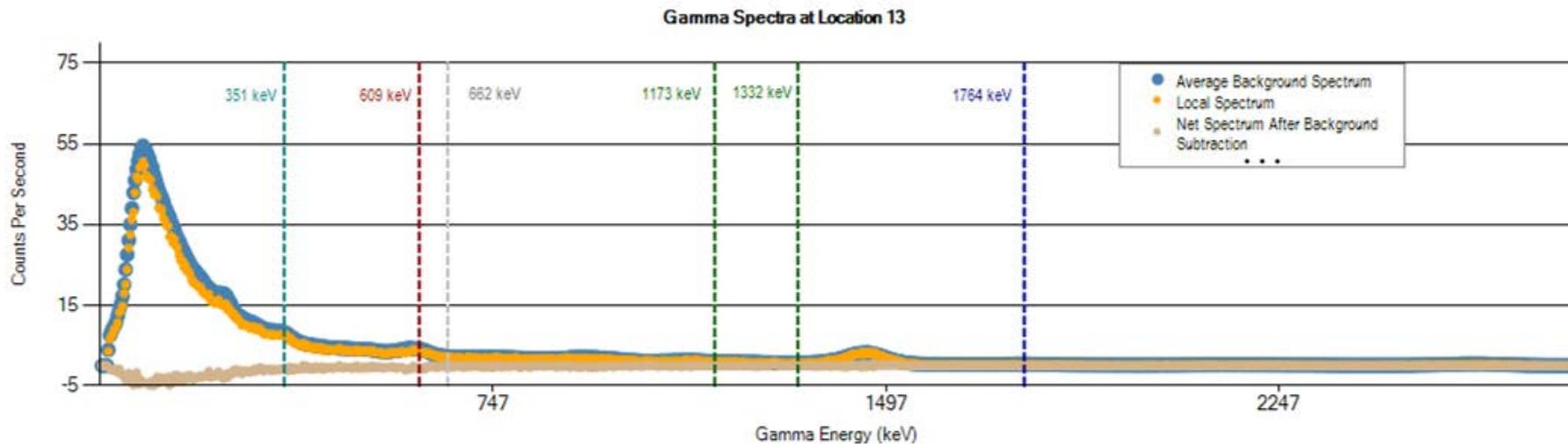
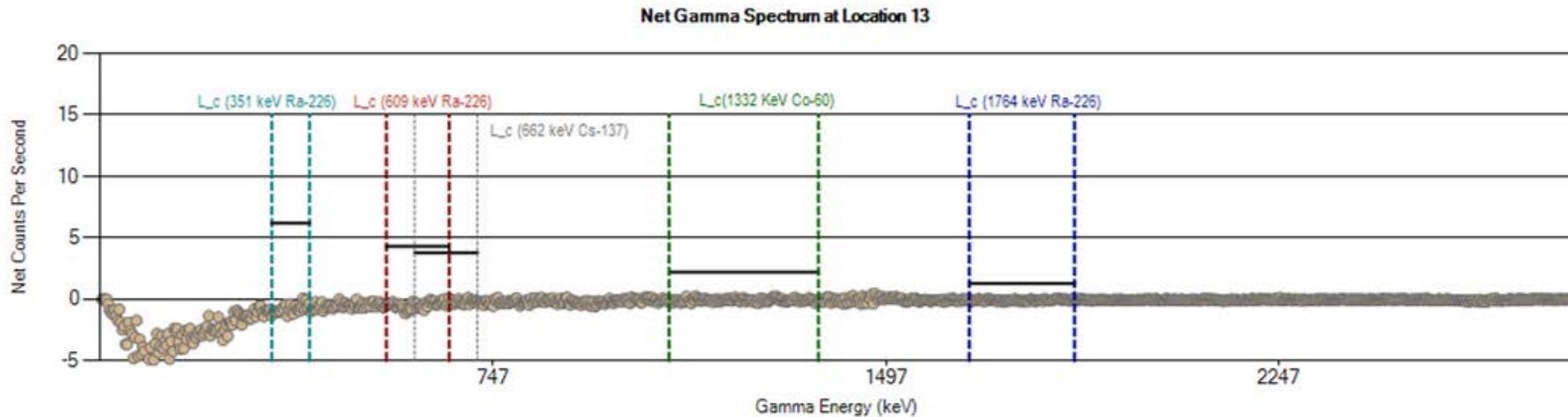
Net Gamma Spectrum at Location 12



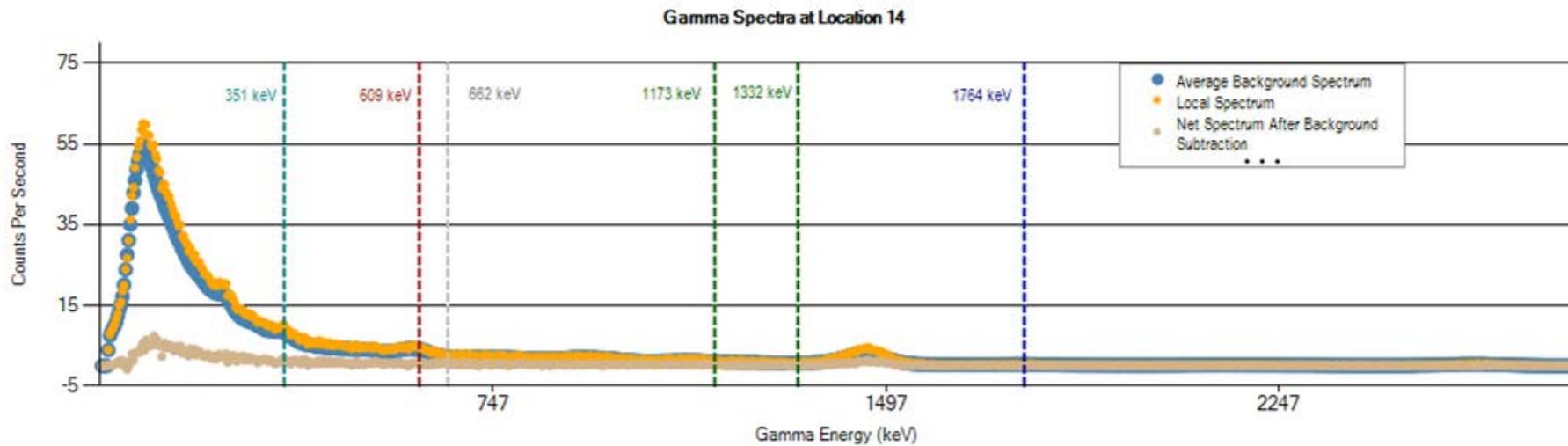
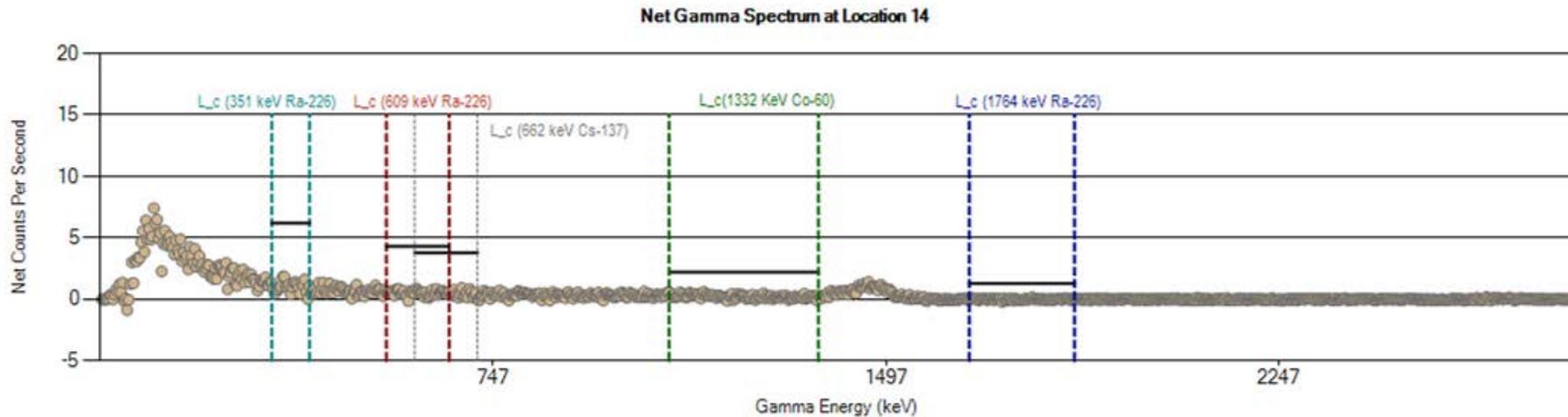
Gamma Spectra at Location 12



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	901	133	20	23	156	144	114	178	95	3702
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

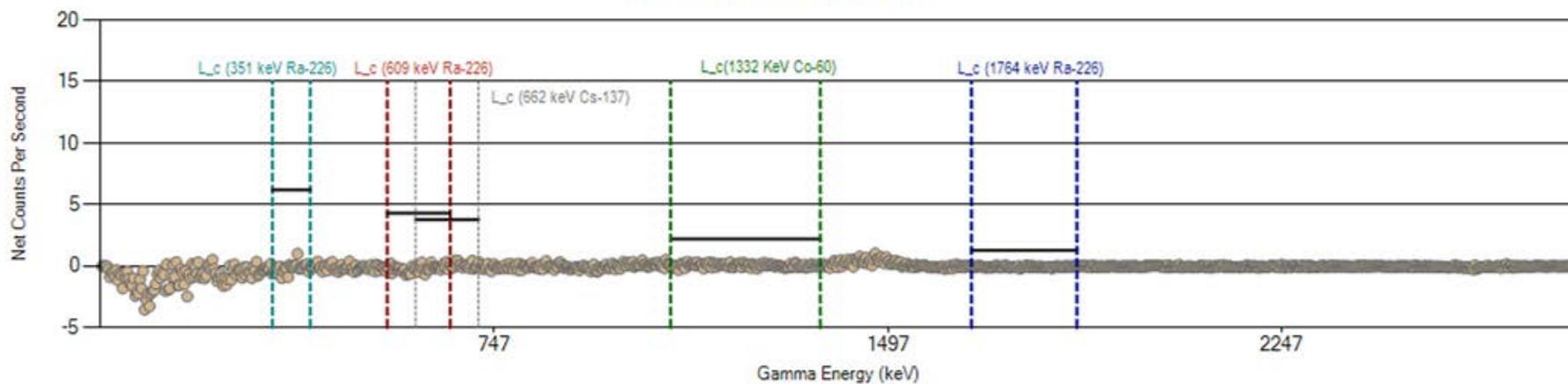


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	766	114	16	19	134	122	96	155	82	3239
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

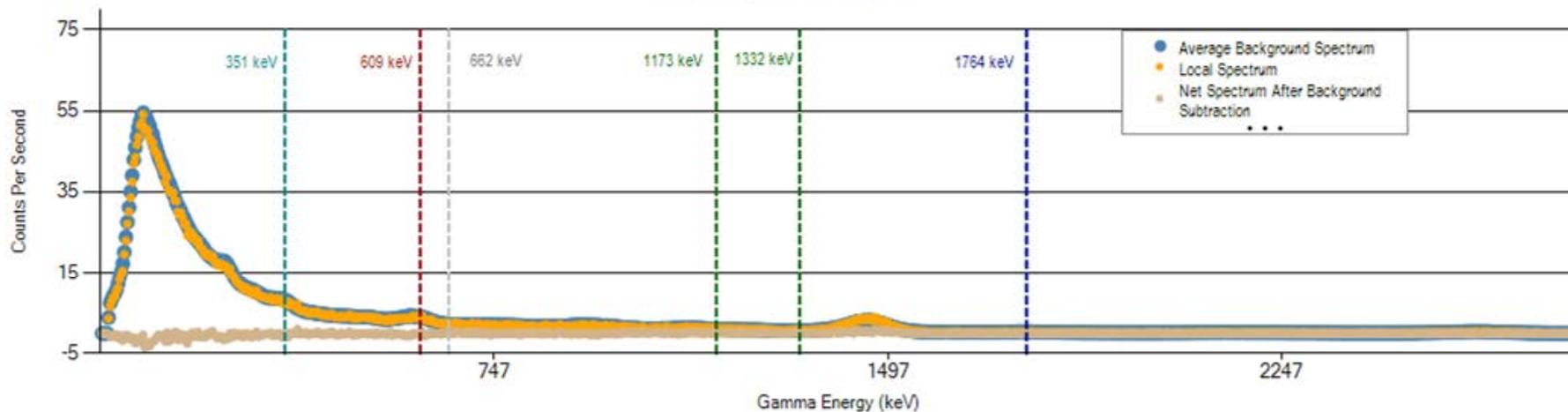


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	1016	152	21	25	176	161	126	199	110	4078
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

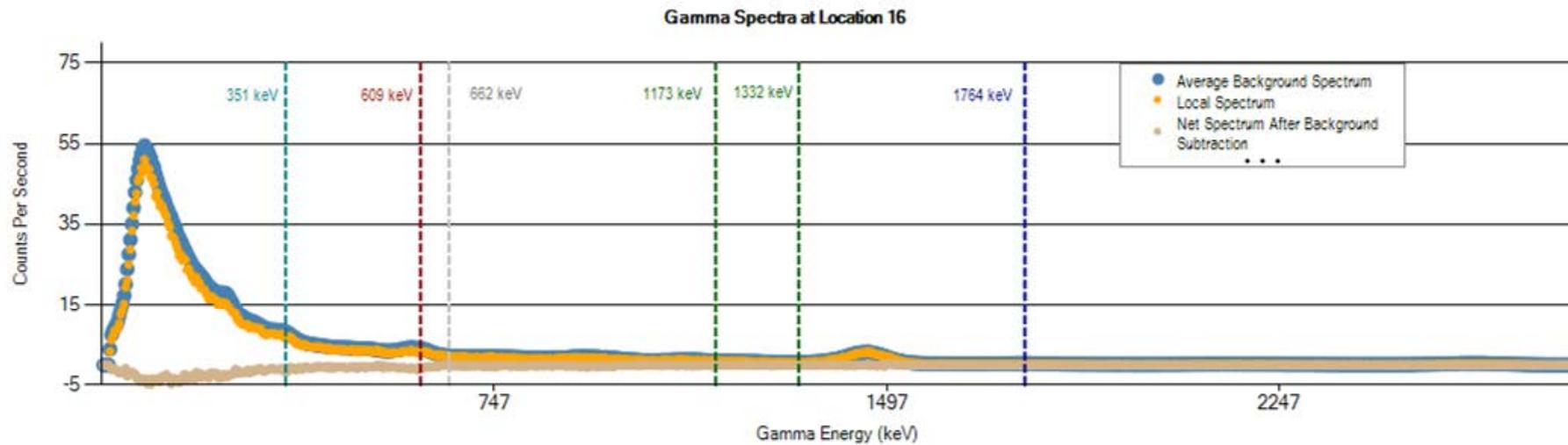
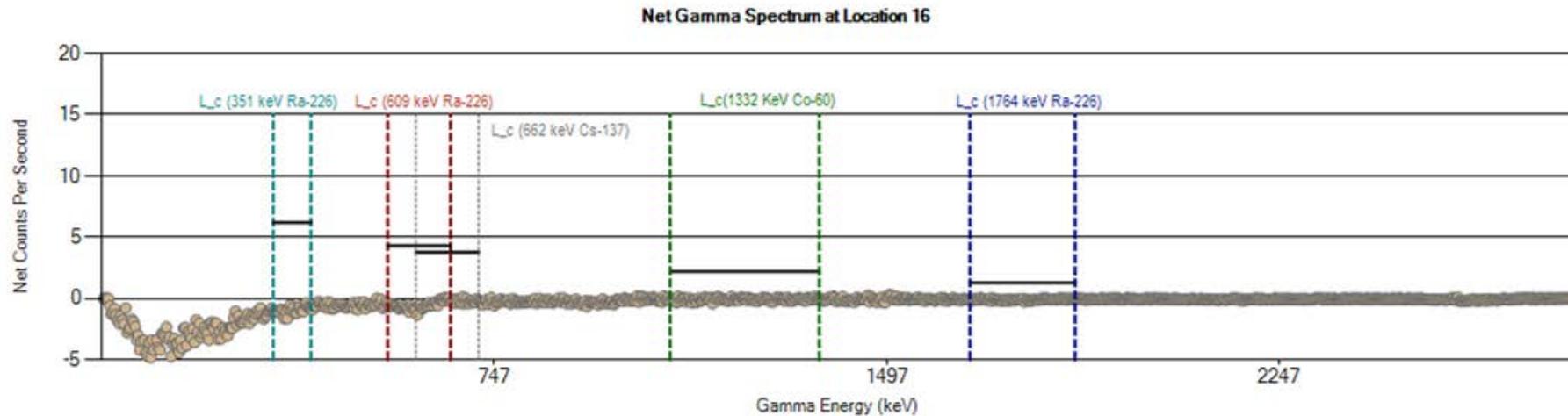
Net Gamma Spectrum at Location 15



Gamma Spectra at Location 15

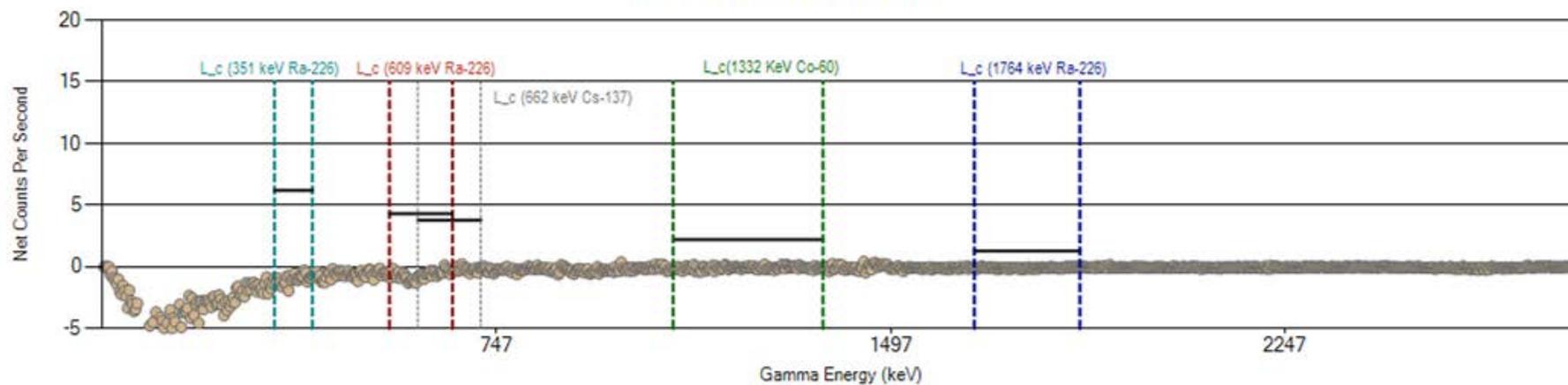


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	854	133	17	20	146	133	107	171	95	3520
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

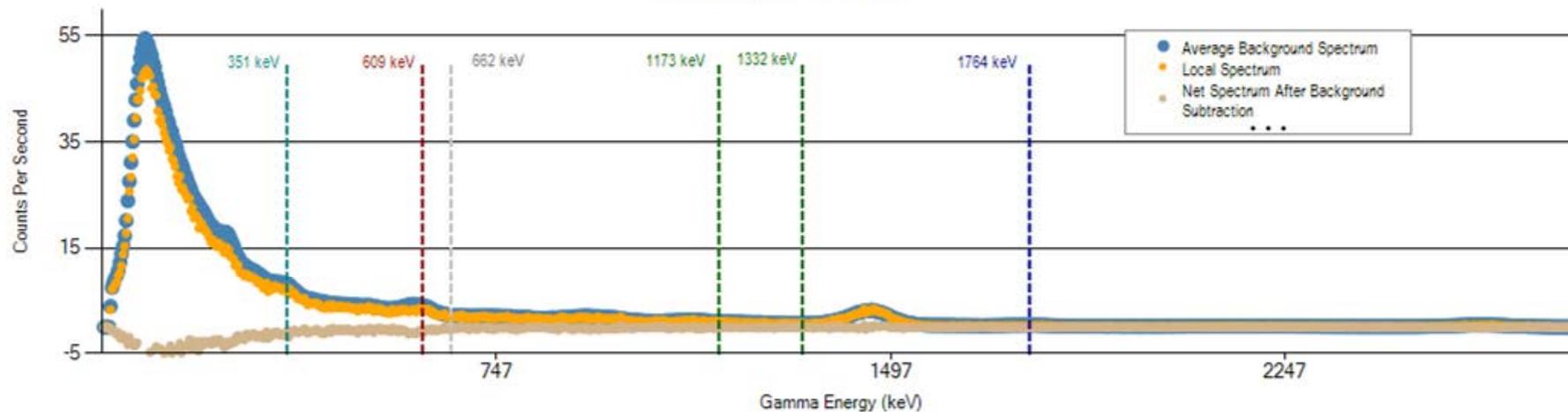


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	752	112	15	18	131	119	95	151	82	3222
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 17

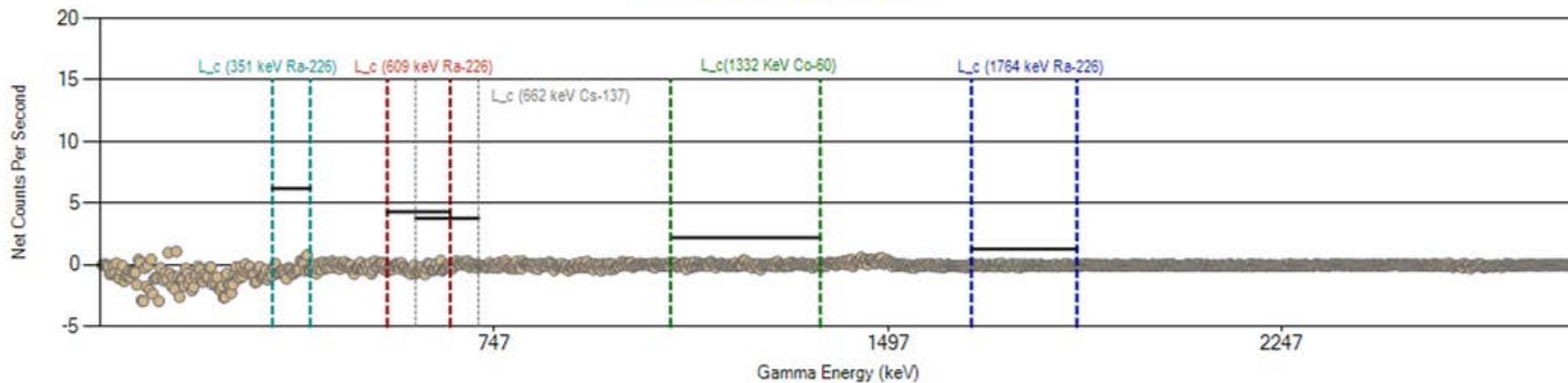


Gamma Spectra at Location 17

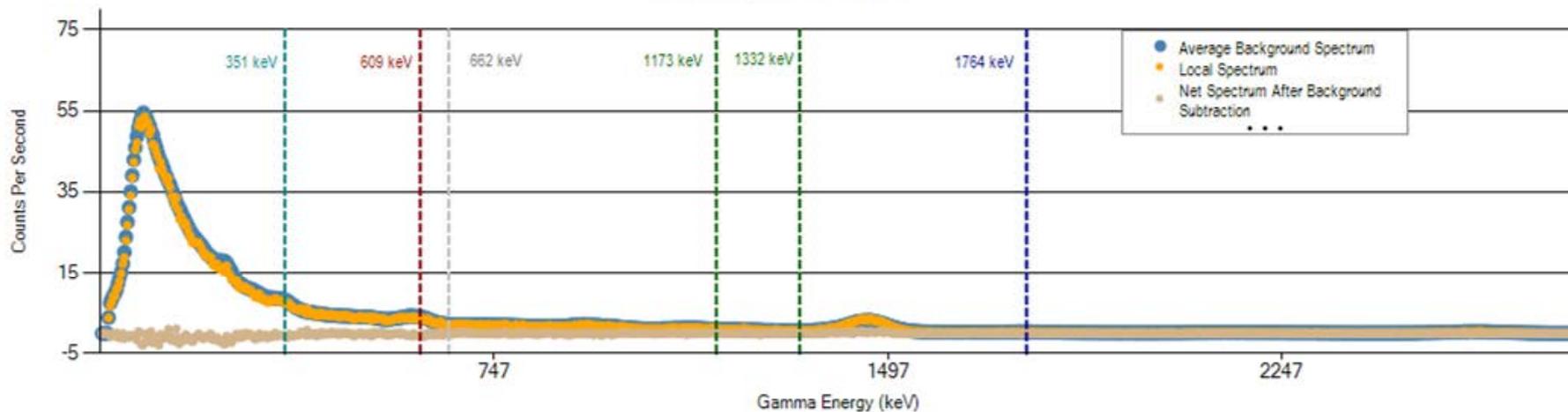


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	743	111	15	17	130	115	93	150	81	3152
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 18

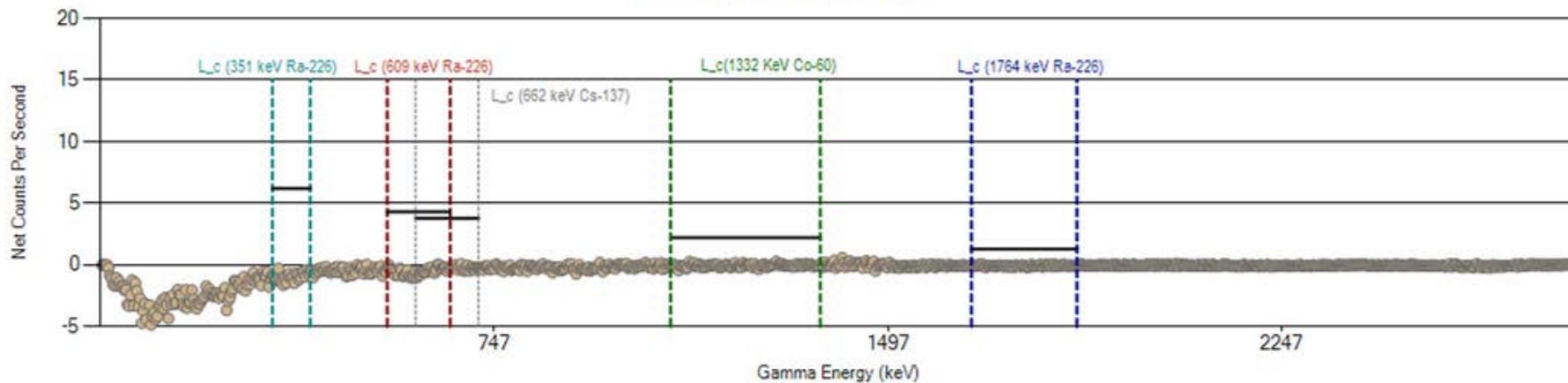


Gamma Spectra at Location 18

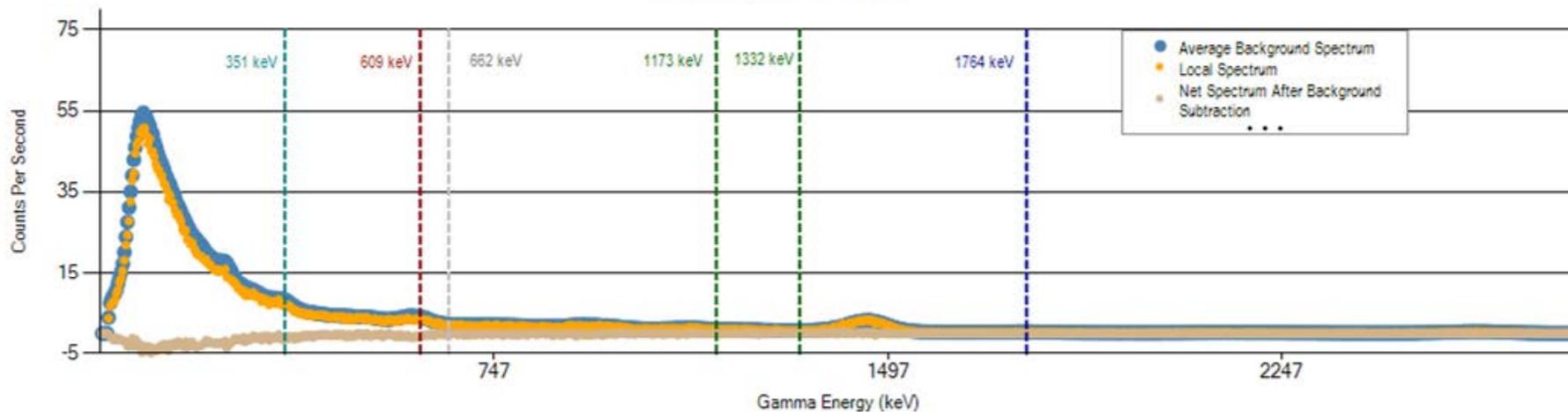


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	830	124	18	20	146	130	102	166	89	3477
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

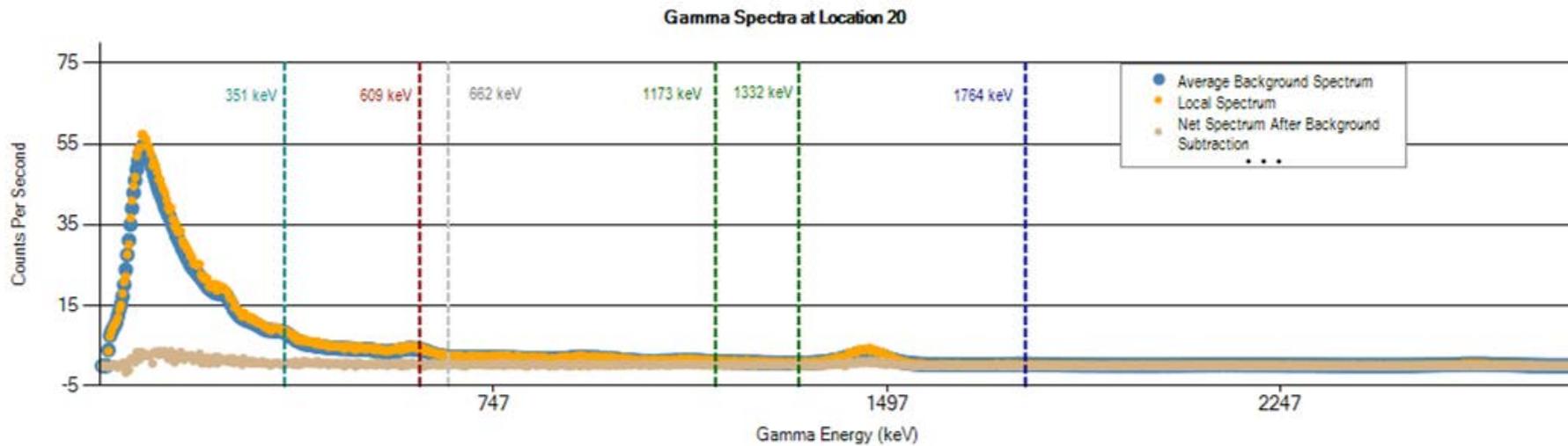
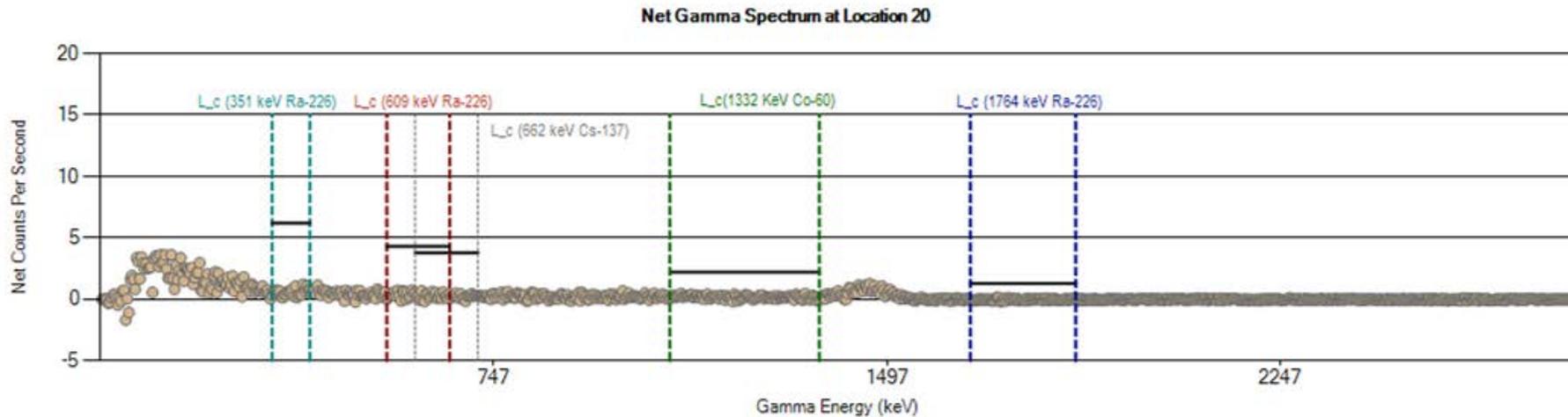
Net Gamma Spectrum at Location 19



Gamma Spectra at Location 19

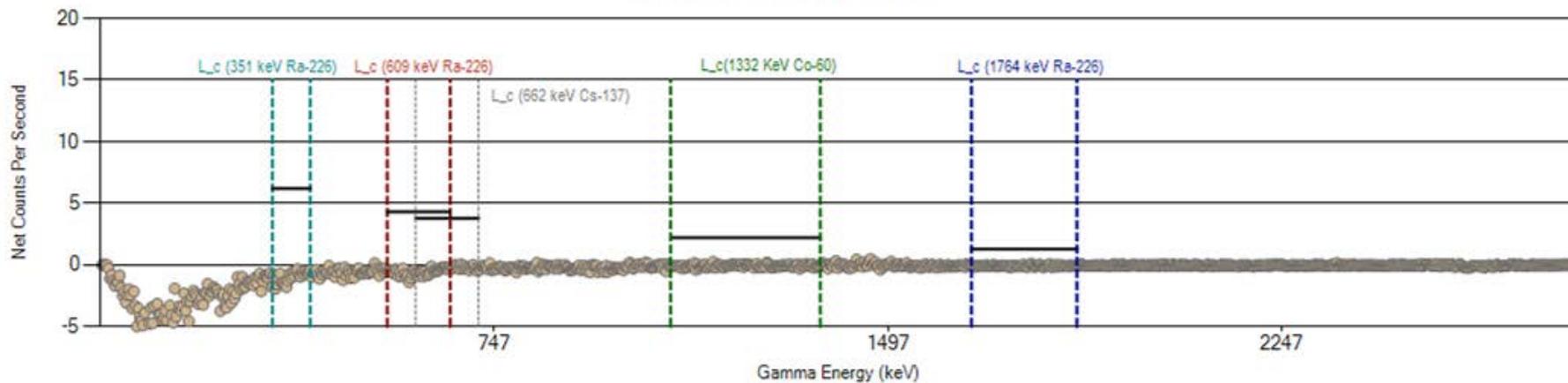


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	764	114	16	18	134	120	93	151	84	3248
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

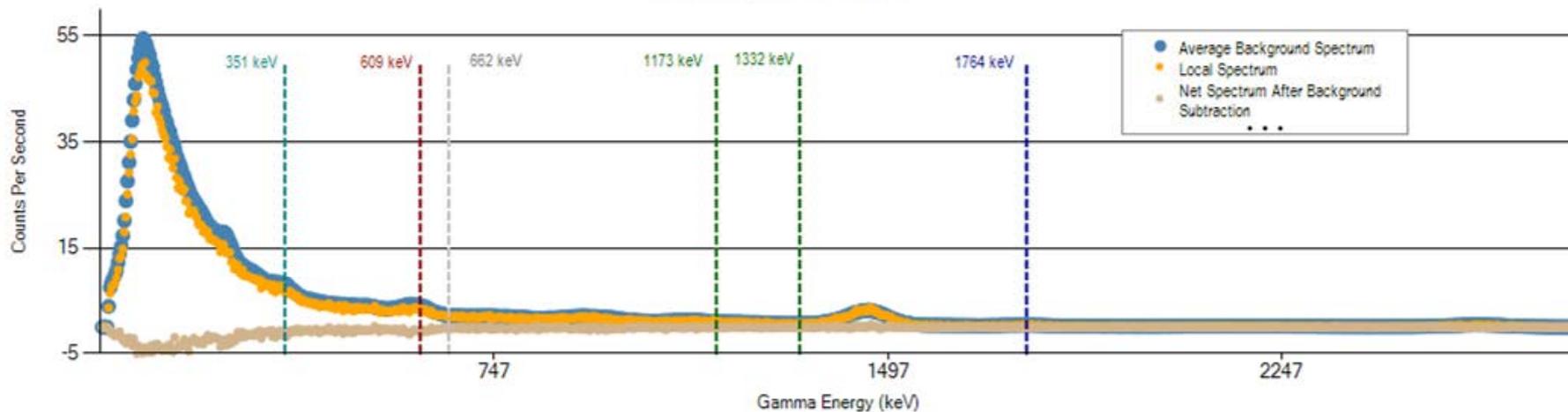


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	962	144	19	23	166	154	118	189	106	3891
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 21

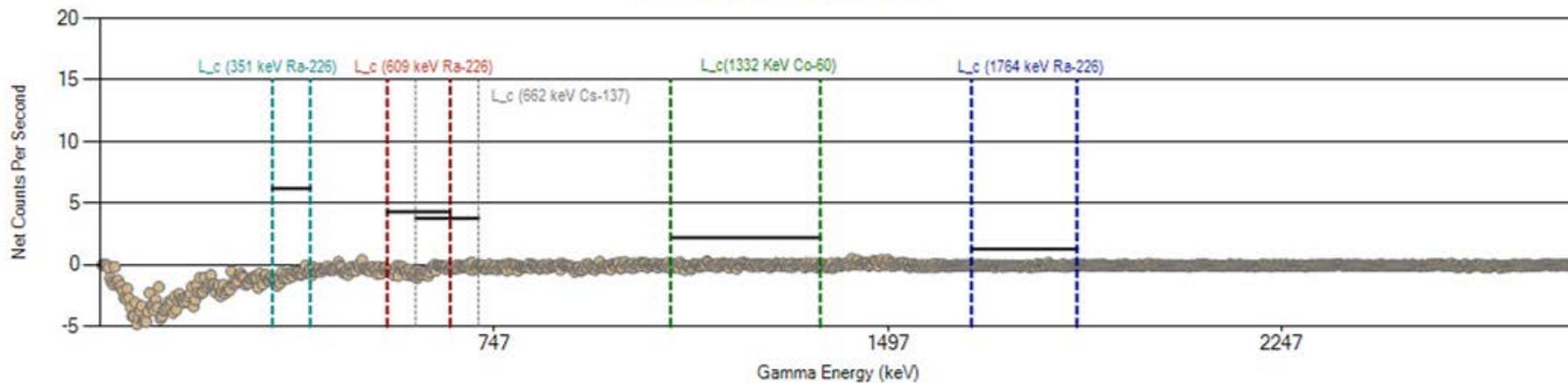


Gamma Spectra at Location 21

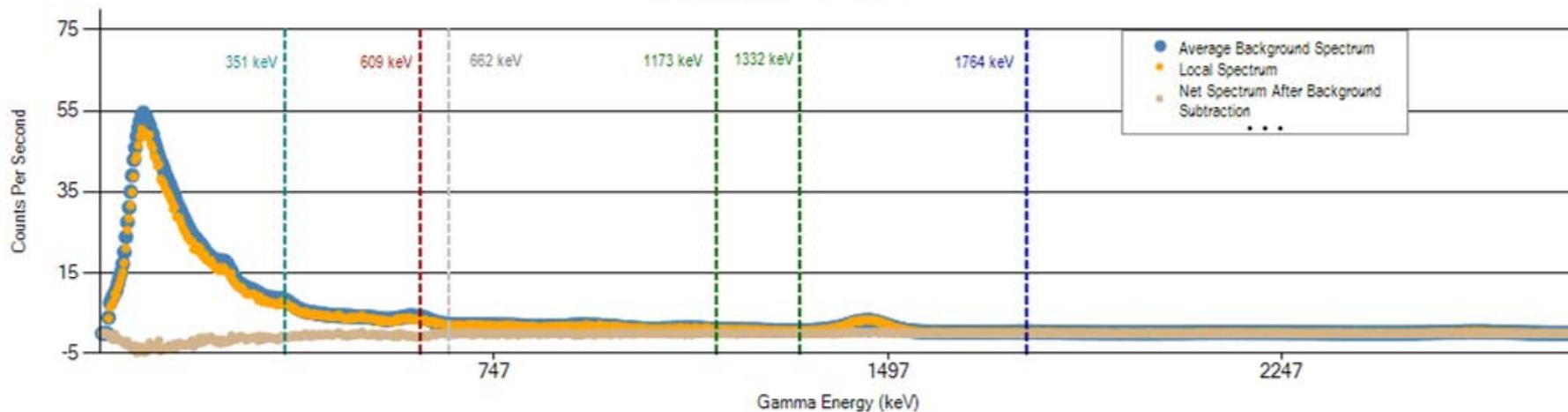


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	752	114	15	19	129	117	93	150	82	3205
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

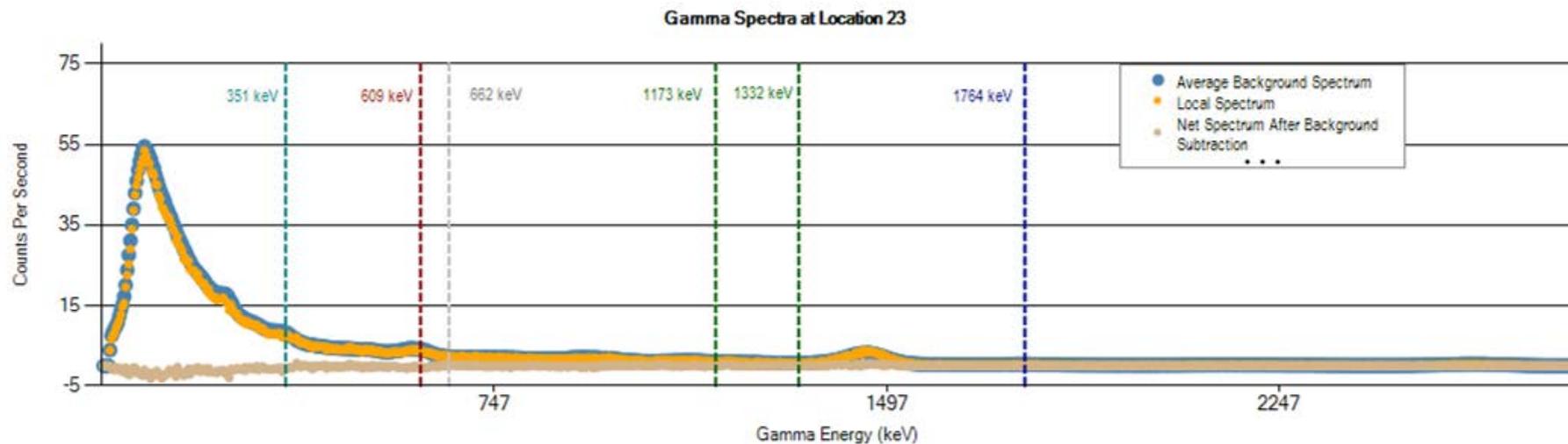
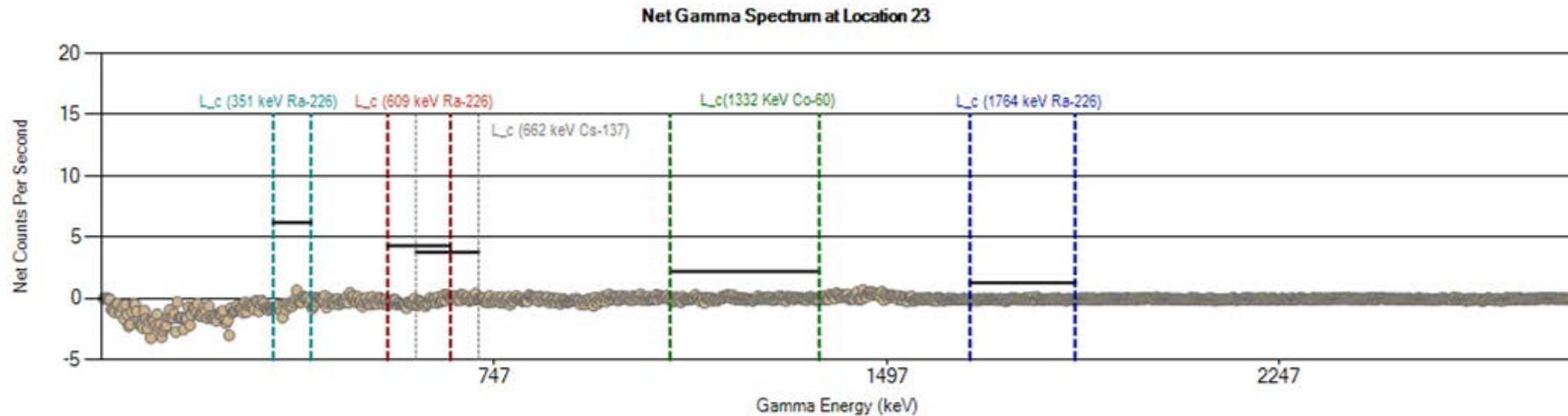
Net Gamma Spectrum at Location 22



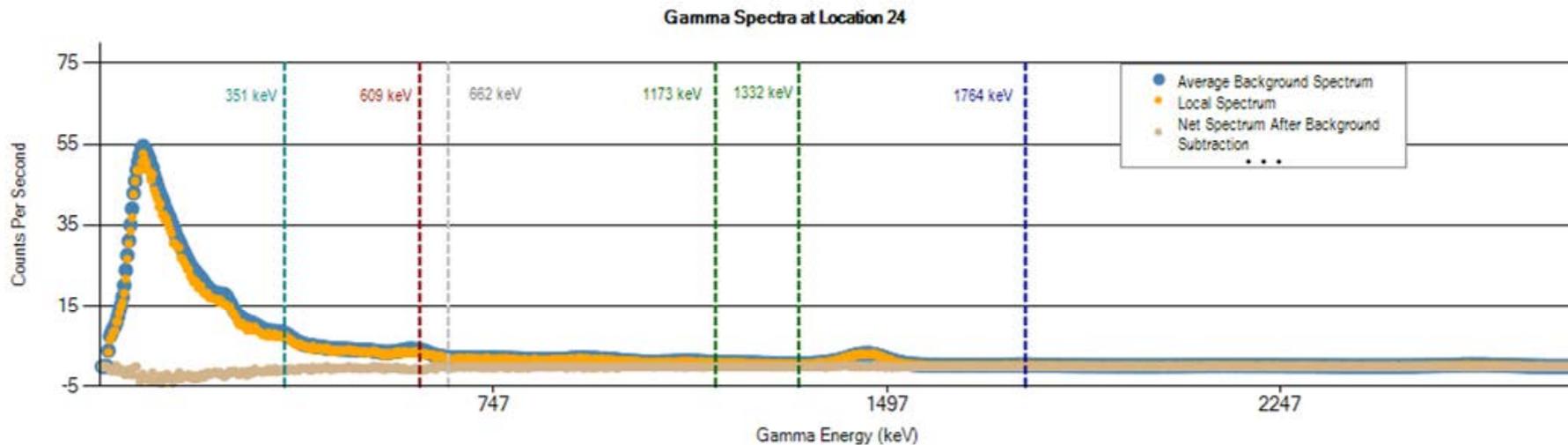
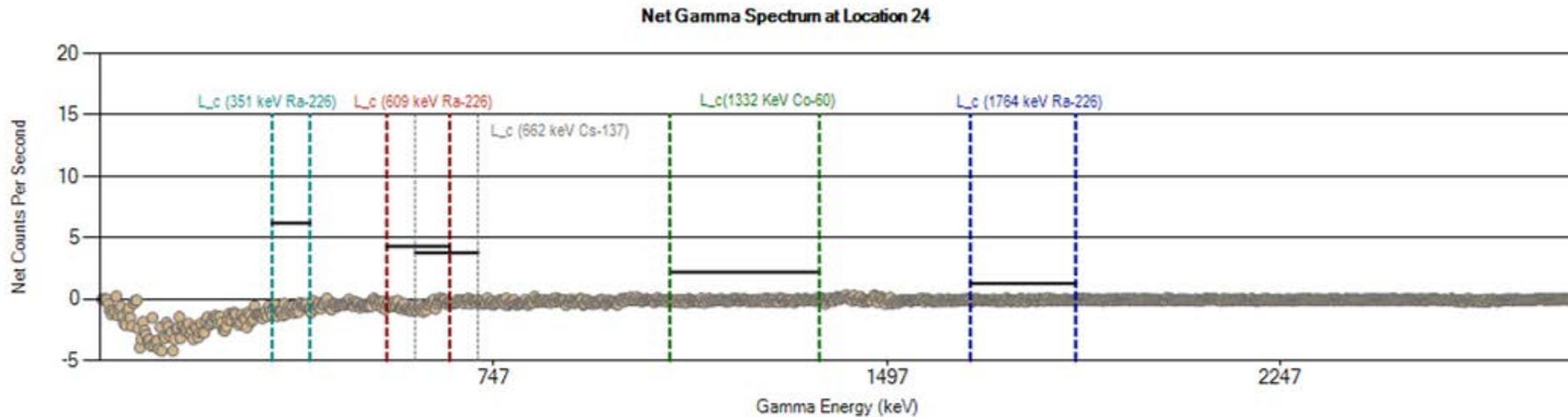
Gamma Spectra at Location 22



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	790	119	16	19	137	122	96	154	86	3295
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

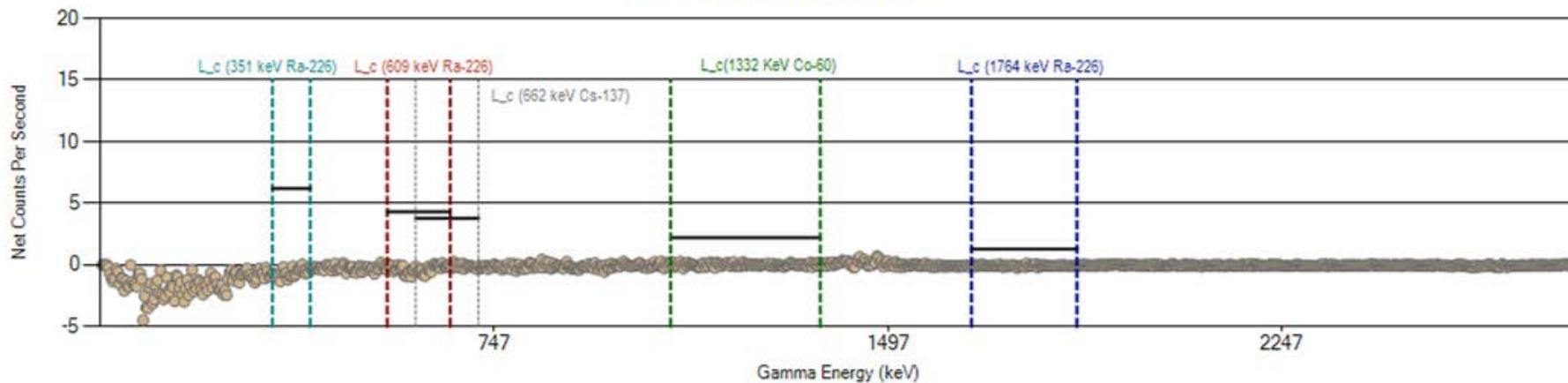


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	826	125	17	20	144	130	105	165	89	3439
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

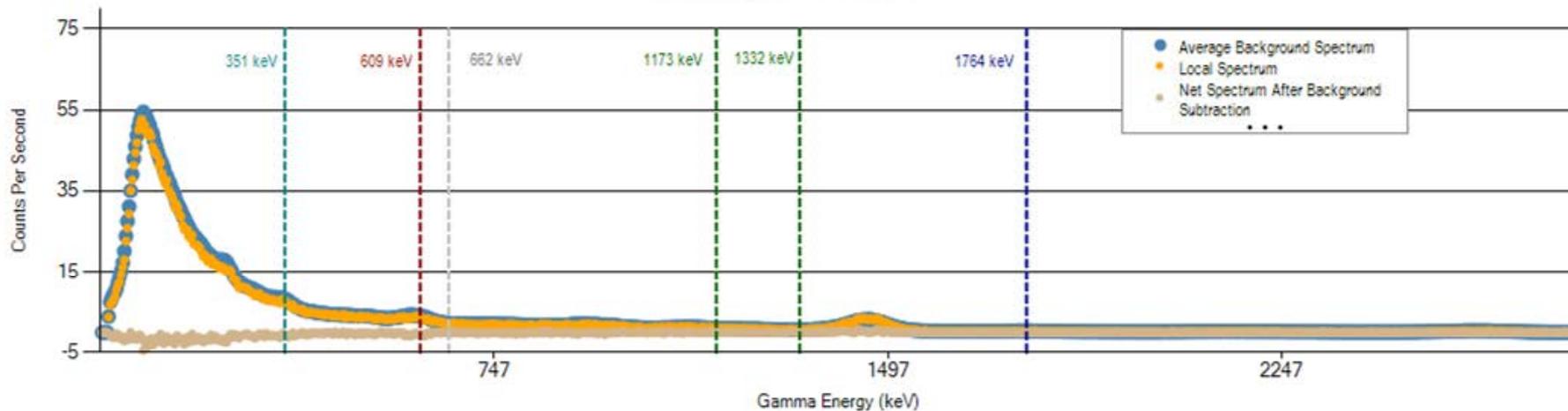


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 24 (cps)	766	113	16	19	136	121	95	155	80	3299
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

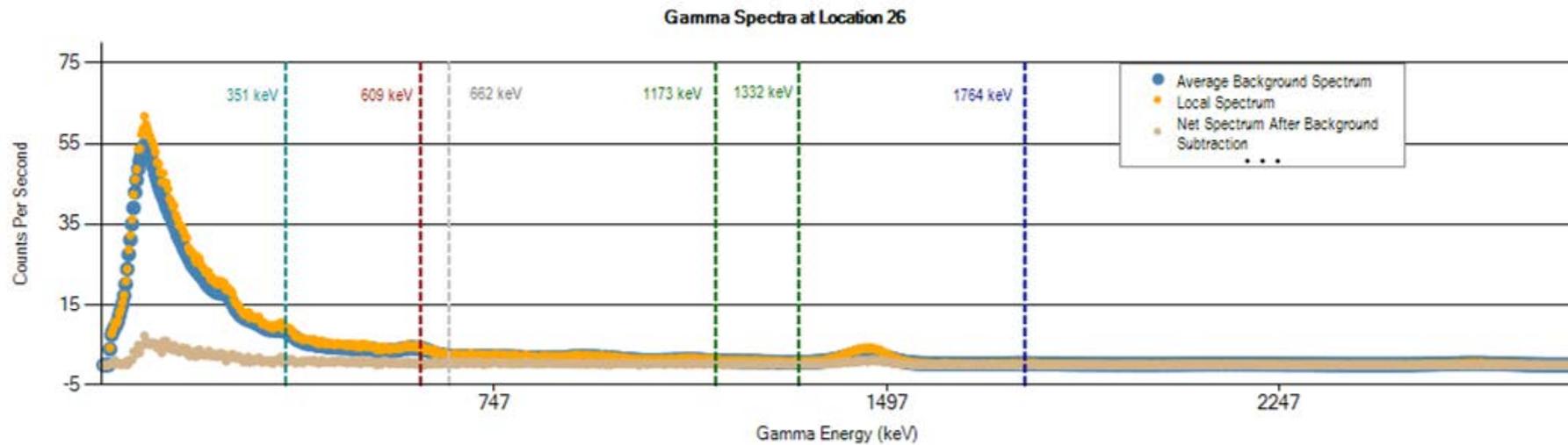
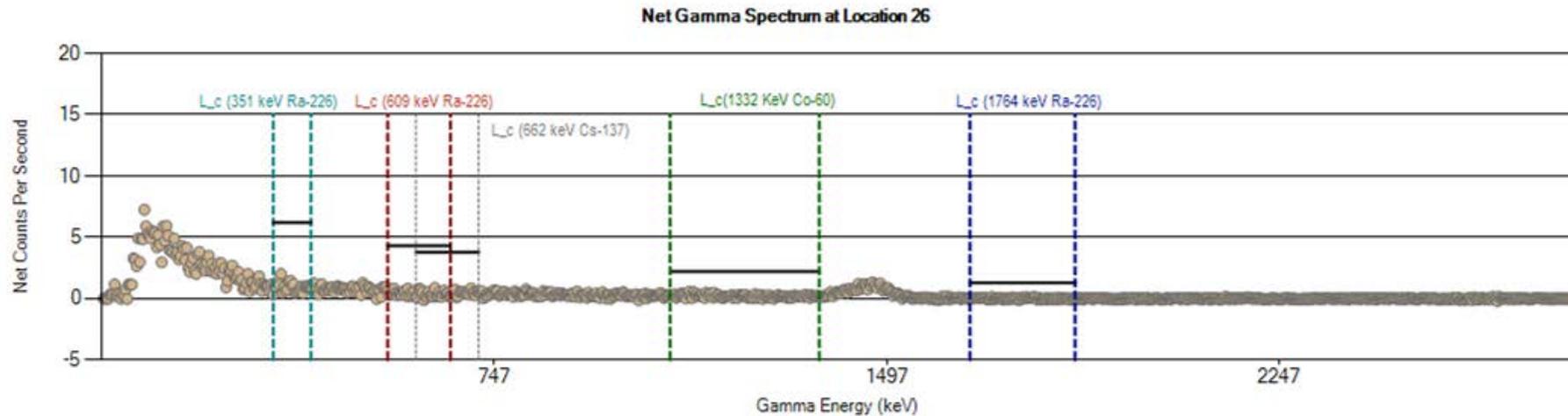
Net Gamma Spectrum at Location 25



Gamma Spectra at Location 25

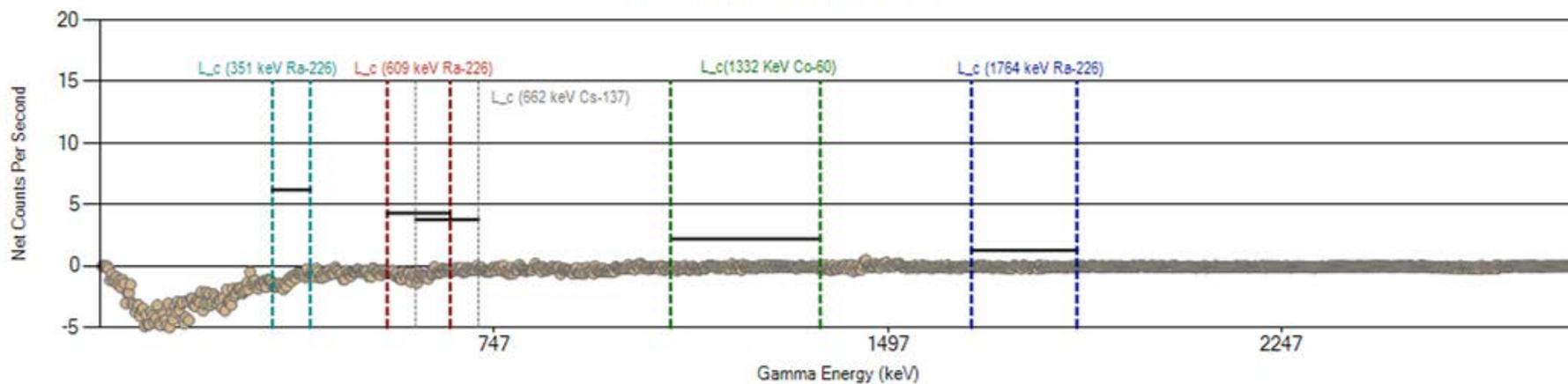


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 25 (cps)	810	123	16	19	142	128	100	159	90	3401
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

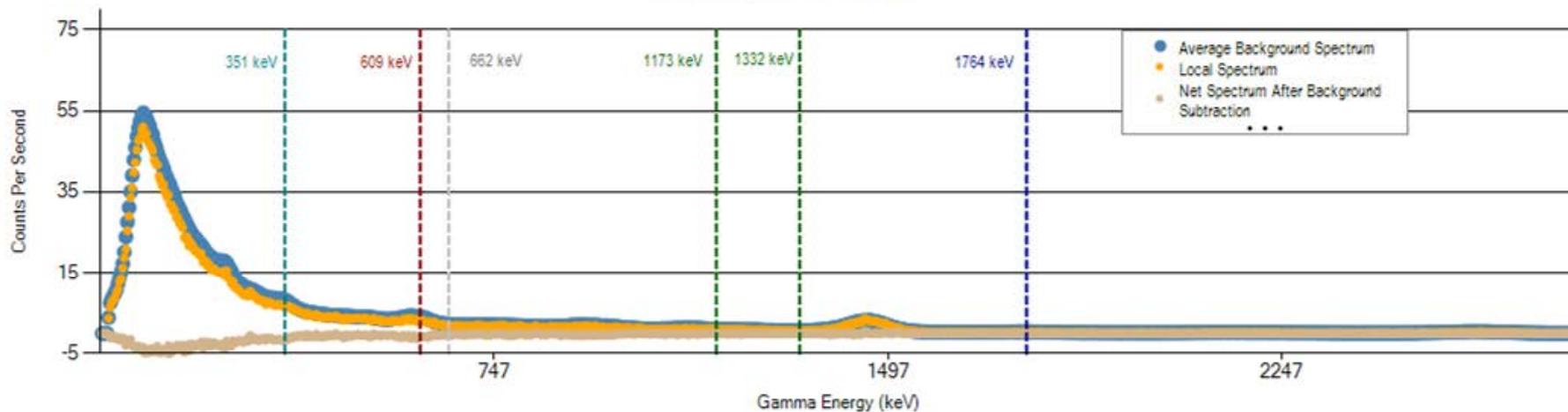


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 26 (cps)	1008	151	21	24	177	156	124	198	109	4058
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Net Gamma Spectrum at Location 27

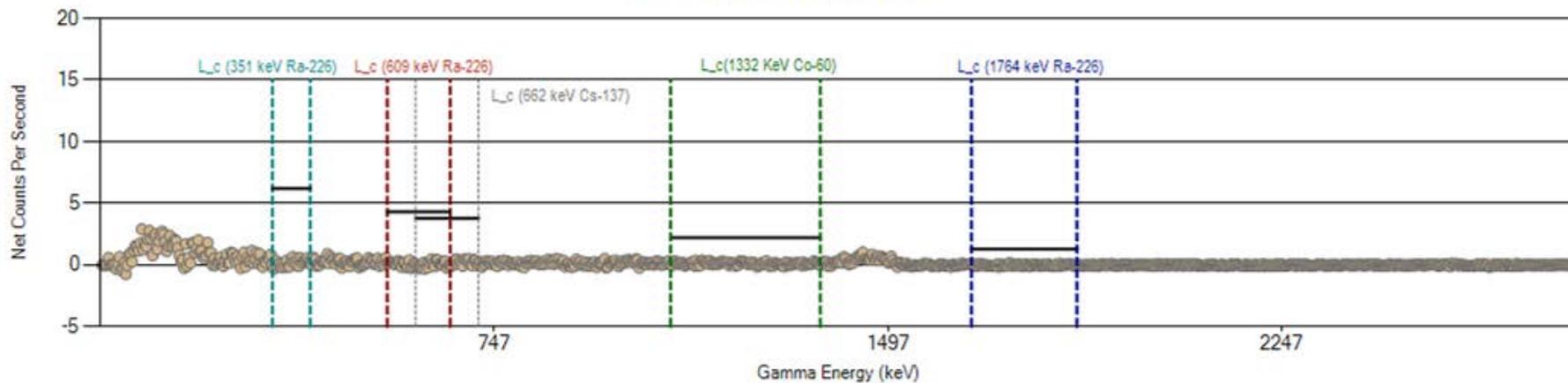


Gamma Spectra at Location 27

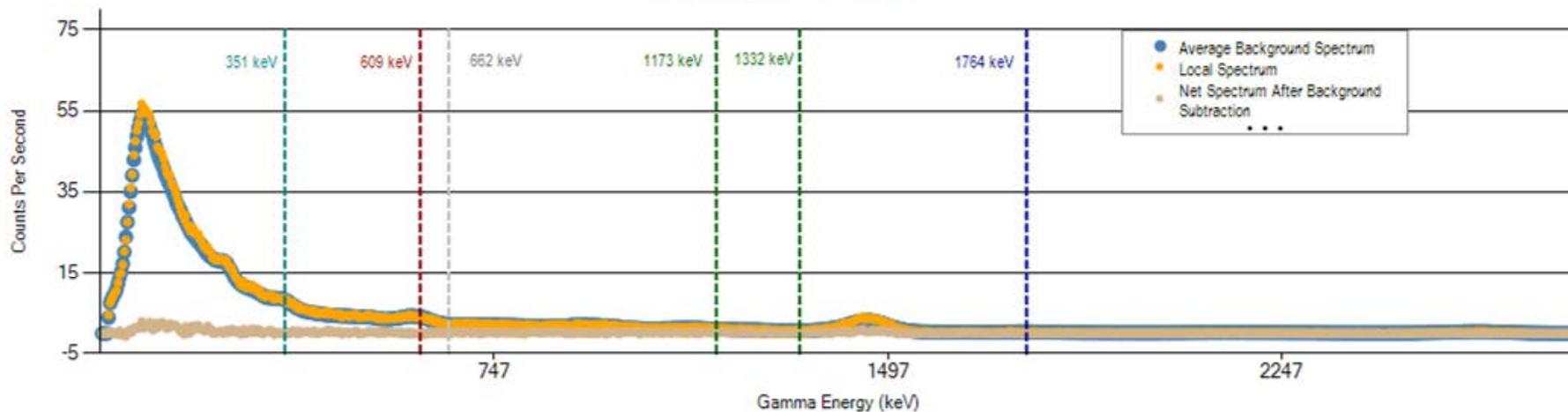


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 27 (cps)	738	113	15	18	129	114	89	148	80	3185
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

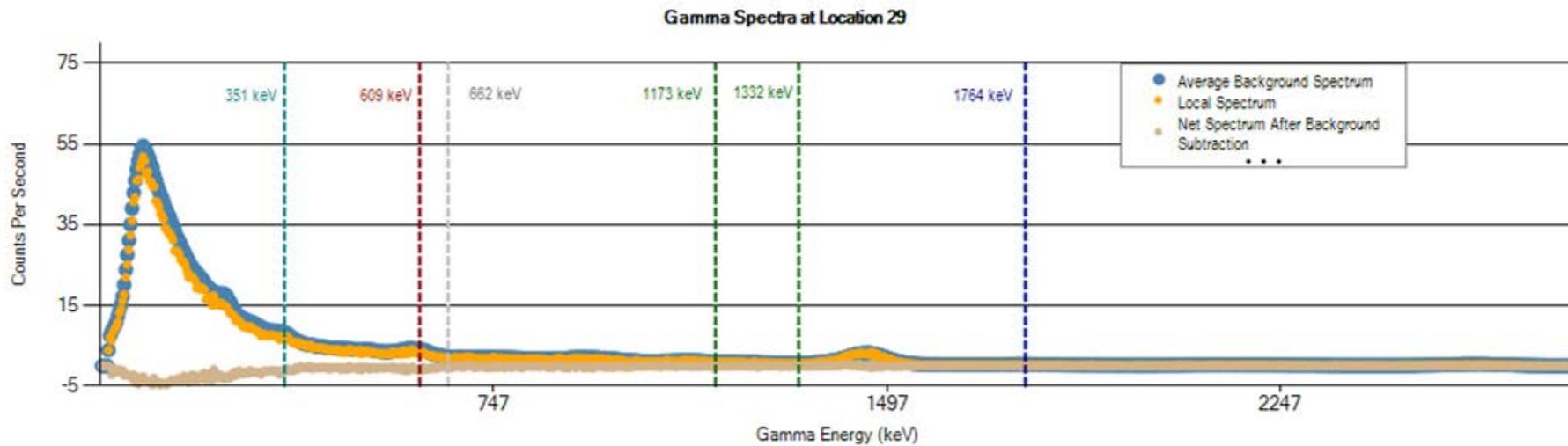
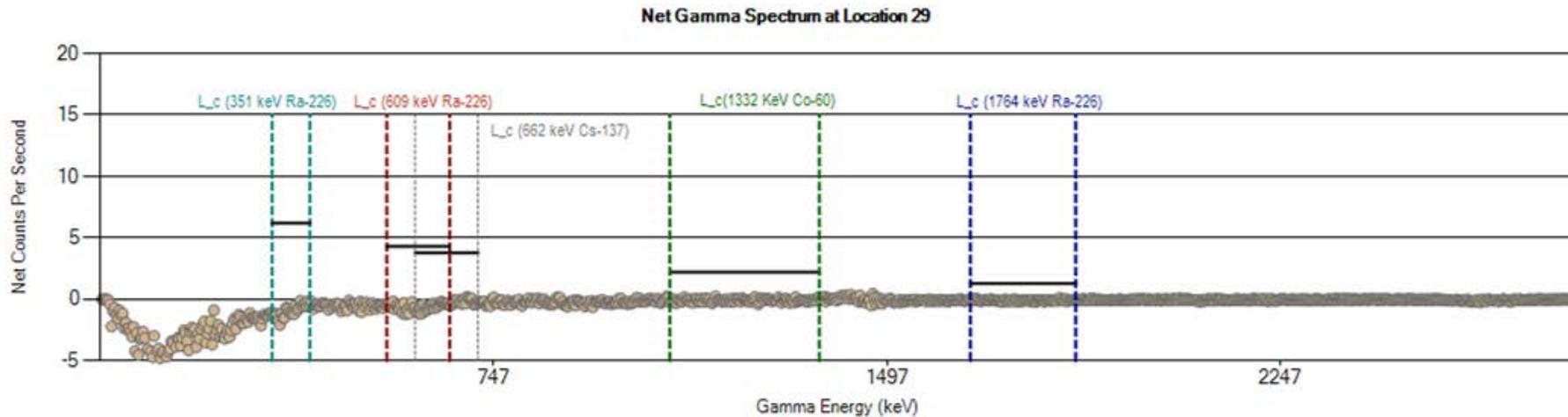
Net Gamma Spectrum at Location 28



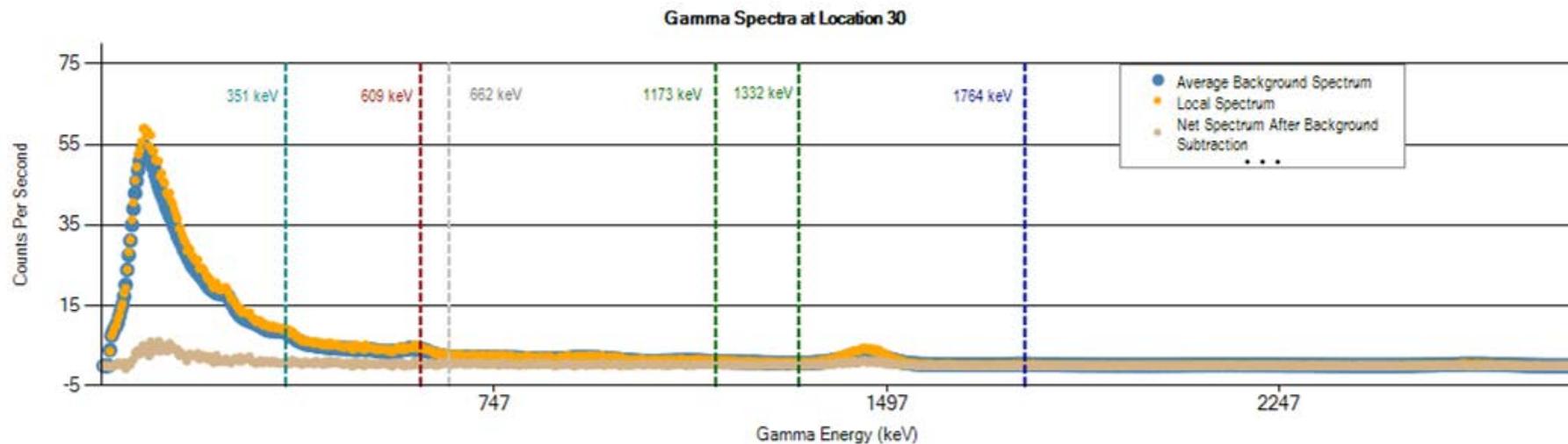
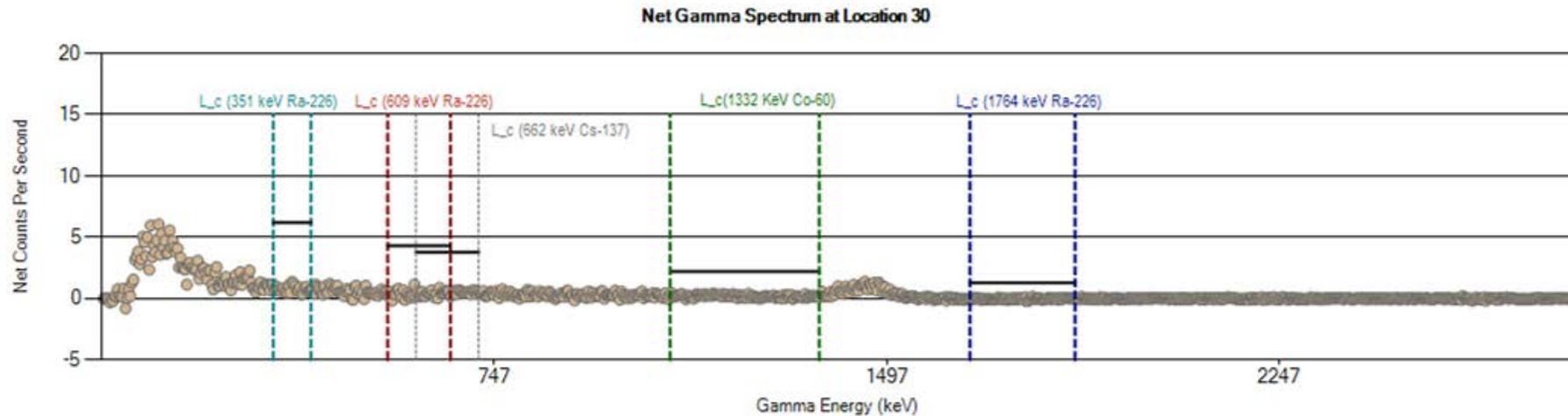
Gamma Spectra at Location 28



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 28 (cps)	916	133	19	23	159	143	112	179	100	3767
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 29 (cps)	749	113	15	18	130	115	91	152	81	3206
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

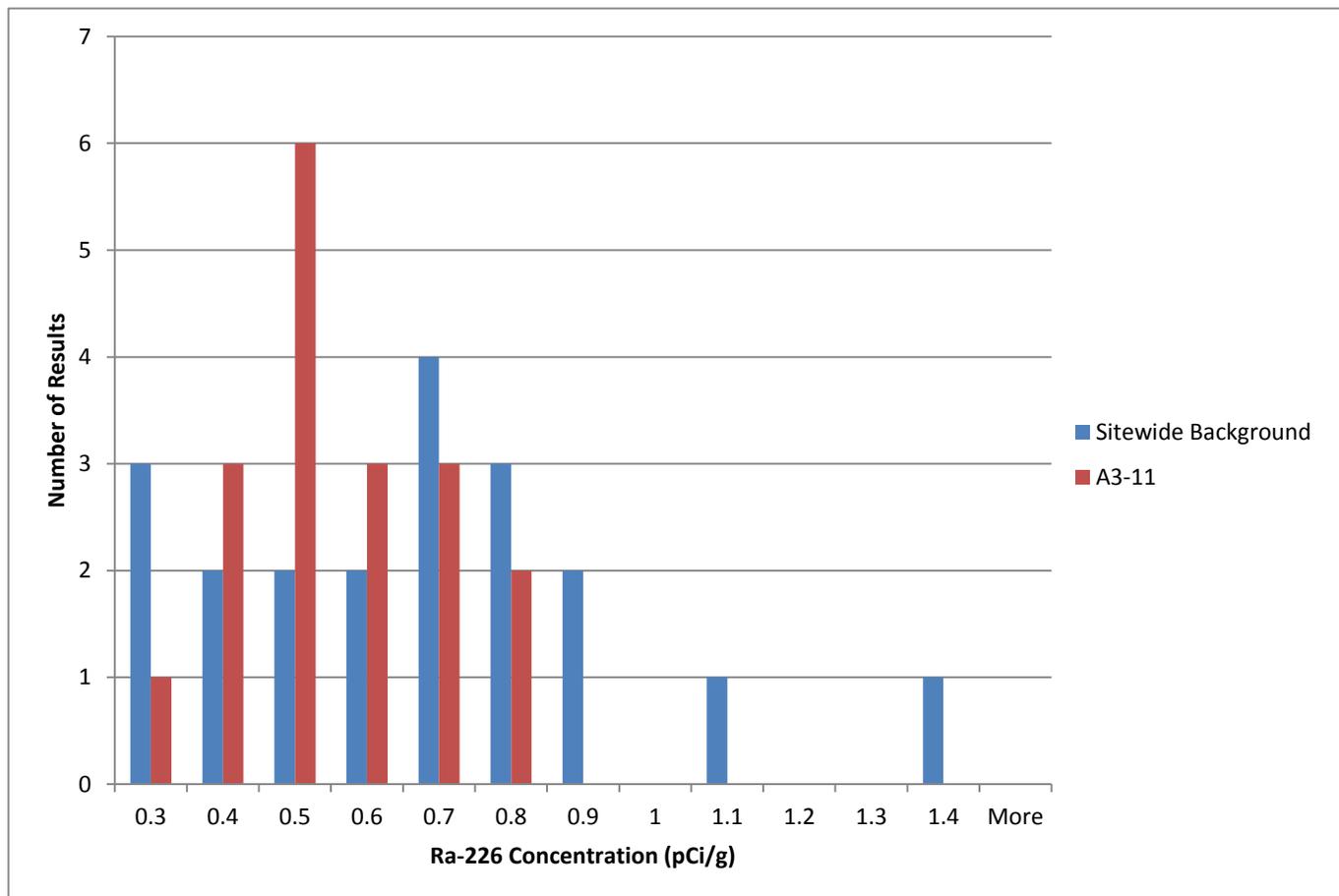


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 30 (cps)	998	152	20	24	169	156	126	193	108	3998
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Histogram, RSY A3 (Use 11) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

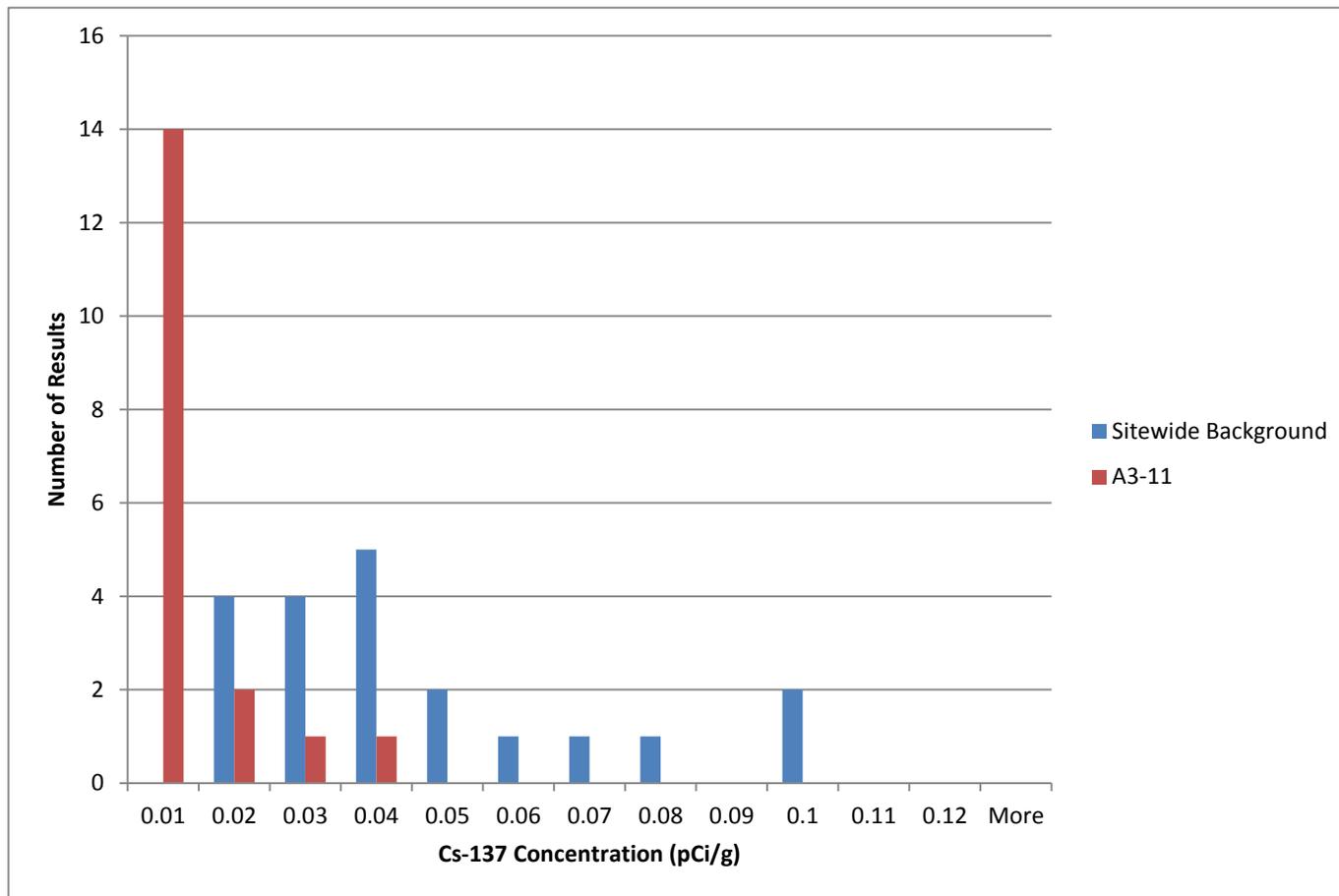
A3-11	
<i>Bin</i>	<i>Frequency</i>
0.3	1
0.4	3
0.5	6
0.6	3
0.7	3
0.8	2
0.9	0
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



Histogram, RSY A3 (Use 11) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

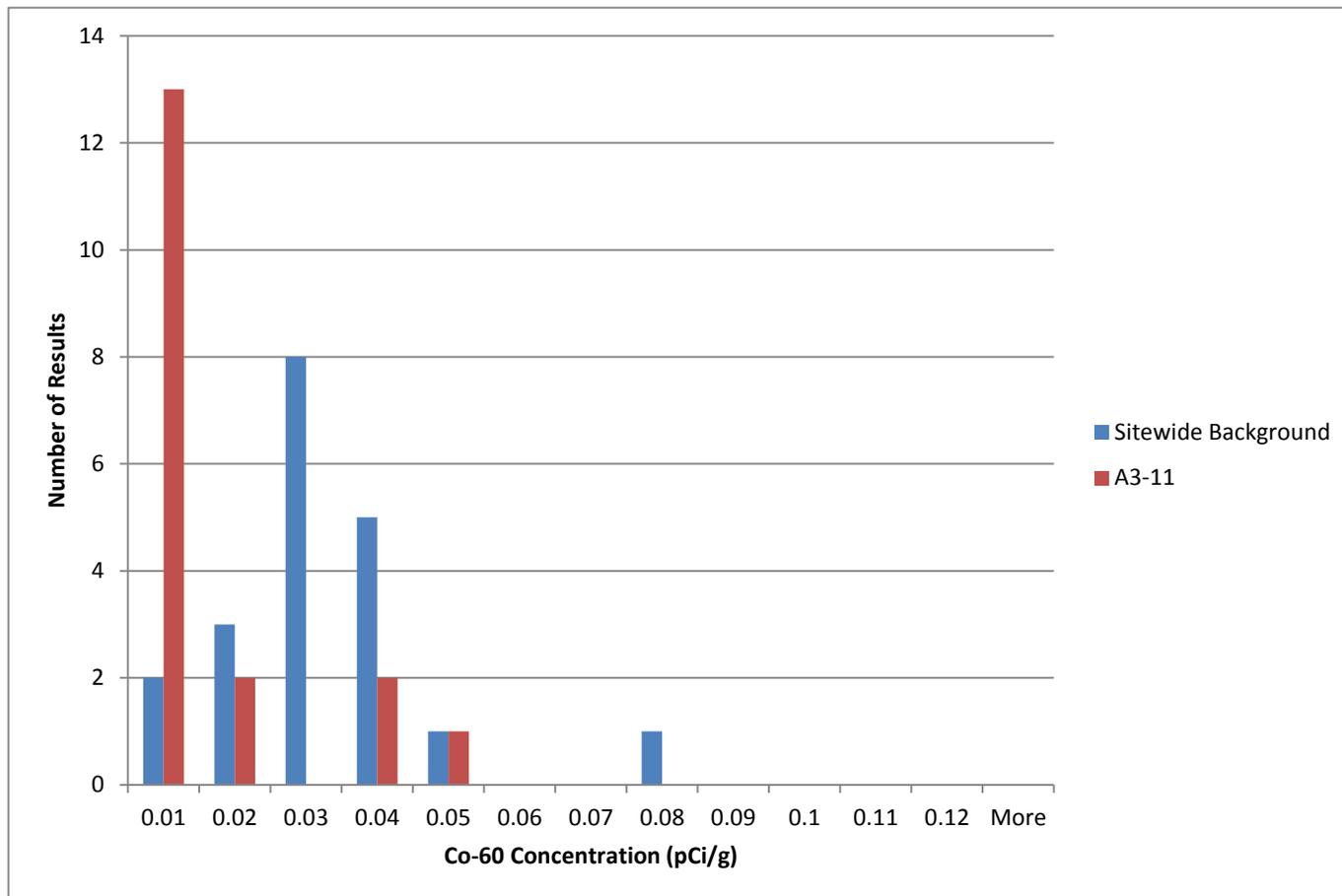
A3-11	
<i>Bin</i>	<i>Frequency</i>
0.01	14
0.02	2
0.03	1
0.04	1
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



Histogram, RSY A3 (Use 11) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	2
0.02	3
0.03	8
0.04	5
0.05	1
0.06	0
0.07	0
0.08	1
0.09	0
0.1	0
0.11	0
0.12	0
More	0

A3-11	
<i>Bin</i>	<i>Frequency</i>
0.01	13
0.02	2
0.03	0
0.04	2
0.05	1
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



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TestAmerica Job ID: 160-29411-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:
8/6/2018 4:27:41 PM

Rhonda Ridenhower, Manager of Project Management
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Results relate only to the items tested and the sample(s) as received by the laboratory.

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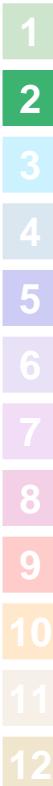


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Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Job ID: 160-29411-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29411-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Job ID: 160-29411-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 07/10/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYA3-U11-S001 (160-29411-1) and PE2-RSYA3-U11-S011 (160-29411-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/10/2018, prepared on 07/16/2018 and analyzed on 08/02/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYA3-U11-S001 (160-29411-1) and PE2-RSYA3-U11-S011 (160-29411-11). The samples contained rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYA3-U11-S001 (160-29411-1), PE2-RSYA3-U11-S002 (160-29411-2), PE2-RSYA3-U11-S003 (160-29411-3), PE2-RSYA3-U11-S004 (160-29411-4), PE2-RSYA3-U11-S005 (160-29411-5), PE2-RSYA3-U11-S006 (160-29411-6), PE2-RSYA3-U11-S007 (160-29411-7), PE2-RSYA3-U11-S008 (160-29411-8), PE2-RSYA3-U11-S009 (160-29411-9), PE2-RSYA3-U11-S010 (160-29411-10), PE2-RSYA3-U11-S011 (160-29411-11), PE2-RSYA3-U11-S012 (160-29411-12), PE2-RSYA3-U11-S013 (160-29411-13), PE2-RSYA3-U11-S014 (160-29411-14), PE2-RSYA3-U11-S015 (160-29411-15), PE2-RSYA3-U11-S016 (160-29411-16), PE2-RSYA3-U11-S017 (160-29411-17) and PE2-RSYA3-U11-S018 (160-29411-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/10/2018, prepared on 07/11/2018 and analyzed on 08/02/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

PE2-RSYA3-U11-S008 (160-29411-8), PE2-RSYA3-U11-S015 (160-29411-15) and PE2-RSYA3-U11-S016 (160-29411-16)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Project Number: 500506

CTO-013 RSYA3 USE 11 Shoreline
Remediation Spools Systematic

Project Name: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.9.18

Waybill Number: 176695451391681959

Lab Destination: TestAmerica (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: **Nels Johnson**
(Name & phone #)

Send Report To: **Eddie Kalombo**

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): **N. J. J.**

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Preservative (water) Preservative (soil) Container Type	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)	Analyses Requested	Dose Rate µR/hr
		Date	Time	Method							
PE2-RSYA3-U11-S001	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1346	G	SO	1	16 oz. plastic jar	X	X		S
PE2-RSYA3-U11-S002	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1347	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S003	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1348	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S004	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1350	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S005	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1352	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S006	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1353	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S007	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1355	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S008	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1356	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S009	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1358	G	SO	1	16 oz. plastic jar	X			S
PE2-RSYA3-U11-S010	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1359	G	SO	1	16 oz. plastic jar	X			S



Special Instructions:

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project level. 7 days ingrown draft and follow with 21 days final.

Level Of QC Required: 24-hr 3-day 10-day III

Standard TAT - 10-day

Relinquished By: **M. HISECUM** Date: 7/5/18 Time: 1500
 Relinquished By: **Eddie Kalombo** Date: 7/9/18 Time: 1600

Received By: **Eddie Kalombo** Date: 7/5/18 Time: 1500
 Received By: **[Signature]** Date: 7/10/18 Time: 0850

Method Codes: C = Composite G = Grab
 Matrix Codes: DW = Drinking Water SO = Soil
 GW = Ground Water SL = Sludge
 WW = Waste Water CP = Chip Samples
 A = Air ABS=Asbestos, PO=Pipe Opening





APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

CHAIN OF CUSTODY

Ref. Document # PE2-RSYA3_USE11_SH_SAND#551

Page 2 of 2

Project Number: 500306

CTO-013 RSYA3 USE 11 Shoreline
Remediation Spoils Systematic

Project Name: HPNS - Parcel E-2

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.9.18

Waybill Number: 1266V54513 1681454

Lab Destination: TestAmerica (St. Louis Lab)

13715 Ridler Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA, 94520
Sampler's Name(s): N. Johnson

Sample ID Number	Sample Description	Collection Information		Matrix	# of containers	Preservative (water)		Dose Rate µR/Hr
		Date	Time			Preservative (soil)	Container Type	
PE2-RSYA3-U11-S011	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1401	SO	1	16 oz. plastic jar		
PE2-RSYA3-U11-S012	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1402	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S013	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1404	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S014	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1405	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S015	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1407	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S016	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1408	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S017	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1410	SO	1	16 oz. plastic jar		S
PE2-RSYA3-U11-S018	Parcel E-2 RSYA3 USE 11 Systematic	7/5/18	1411	SO	1	16 oz. plastic jar		S

Gamma Spec (EPA 191.1 M) - (7 day in-growth preliminary results and full 21 day in-growth for full gamma results)	Analyses Requested			
	Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)		
N/A	N/A	N/A		
X	X	X		
X	X	X		
X	X	X		
X	X	X		
X	X	X		
X	X	X		

Special Instructions:
7 days ingrown draft and follow with 21 days final.
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

Level Of OC Required:
 24-hr
 3-day
 10-day
 III Project Specific:

Relinquished By: WINSBEC CHN
Date: 7/5/18 Time: 1500
Received By: EDDIE KALOMBO
Date: 7/9/18 Time: 1600

Relinquished By: EDDIE KALOMBO
Date: 7/5/18 Time: 1500
Received By: Rhonda Ridenhower
Date: 7/10/18 Time: 0850

Relinquished By: _____
Date: _____ Time: _____
Received By: _____
Date: _____ Time: _____

Method Codes: C = Composite G = Grab
Matrix Codes: SO = Soil
DW = Drinking Water
GW = Ground Water
WW = Waste Water
A = Air
ABS = Asbestos, PO = Pipe Opening



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29411-2

Login Number: 29411**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Sample Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29411-1	PE2-RSYA3-U11-S001	Solid	07/05/18 13:46	07/10/18 08:50
160-29411-2	PE2-RSYA3-U11-S002	Solid	07/05/18 13:47	07/10/18 08:50
160-29411-3	PE2-RSYA3-U11-S003	Solid	07/05/18 13:48	07/10/18 08:50
160-29411-4	PE2-RSYA3-U11-S004	Solid	07/05/18 13:50	07/10/18 08:50
160-29411-5	PE2-RSYA3-U11-S005	Solid	07/05/18 13:52	07/10/18 08:50
160-29411-6	PE2-RSYA3-U11-S006	Solid	07/05/18 13:53	07/10/18 08:50
160-29411-7	PE2-RSYA3-U11-S007	Solid	07/05/18 13:55	07/10/18 08:50
160-29411-8	PE2-RSYA3-U11-S008	Solid	07/05/18 13:56	07/10/18 08:50
160-29411-9	PE2-RSYA3-U11-S009	Solid	07/05/18 13:58	07/10/18 08:50
160-29411-10	PE2-RSYA3-U11-S010	Solid	07/05/18 13:59	07/10/18 08:50
160-29411-11	PE2-RSYA3-U11-S011	Solid	07/05/18 14:01	07/10/18 08:50
160-29411-12	PE2-RSYA3-U11-S012	Solid	07/05/18 14:02	07/10/18 08:50
160-29411-13	PE2-RSYA3-U11-S013	Solid	07/05/18 14:04	07/10/18 08:50
160-29411-14	PE2-RSYA3-U11-S014	Solid	07/05/18 14:05	07/10/18 08:50
160-29411-15	PE2-RSYA3-U11-S015	Solid	07/05/18 14:07	07/10/18 08:50
160-29411-16	PE2-RSYA3-U11-S016	Solid	07/05/18 14:08	07/10/18 08:50
160-29411-17	PE2-RSYA3-U11-S017	Solid	07/05/18 14:10	07/10/18 08:50
160-29411-18	PE2-RSYA3-U11-S018	Solid	07/05/18 14:11	07/10/18 08:50

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S001

Lab Sample ID: 160-29411-1

Date Collected: 07/05/18 13:46

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.00747	U	0.0601	0.0601	0.331	0.0488	pCi/g	07/16/18 13:23	08/02/18 05:37	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	88.8		40 - 110					07/16/18 13:23	08/02/18 05:37	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.412		0.317	0.320		0.176	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Actinium-227	-0.300	U	0.521	0.522		0.580	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Bismuth-212	-0.764	U	1.43	1.43		1.12	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Bismuth-214	0.501		0.144	0.153		0.0405	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Cesium-137	0.00854	U	0.0755	0.0756	0.0700	0.0607	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Cobalt-60	-0.0415	U	0.0764	0.0765	0.200	0.0744	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-210	-0.862	U	1.10	1.11		1.37	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-212	0.511		0.108	0.127		0.0436	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-214	0.549		0.164	0.174		0.0668	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Potassium-40	10.0		1.84	2.11		0.350	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Protactinium-231	0.956	U	2.98	2.98		2.41	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Radium-226	0.501		0.144	0.153	0.700	0.0405	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Radium-228	0.412		0.317	0.320		0.176	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thallium-208	0.226		0.0664	0.0704		0.0109	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-228	0.511		0.108	0.127		0.0436	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-232	0.412		0.317	0.320		0.176	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-234	1.70		1.54	1.55		0.897	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Uranium-235	-0.00745	U	0.0101	0.0102		0.310	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Uranium-238	1.70		1.54	1.55		0.897	pCi/g	07/11/18 17:39	08/02/18 15:44	1

Client Sample ID: PE2-RSYA3-U11-S002

Lab Sample ID: 160-29411-2

Date Collected: 07/05/18 13:47

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.653		0.209	0.220		0.0390	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Actinium-227	0.00853	U	0.0376	0.0376		0.760	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-212	-0.0680	U	1.18	1.18		0.757	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-214	0.600		0.155	0.167		0.0473	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cesium-137	-0.0614	U	0.0959	0.0961	0.0700	0.0643	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cobalt-60	0.0220	U	0.0325	0.0326	0.200	0.0258	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-210	0.845	U	2.03	2.03		1.63	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-212	0.541		0.108	0.129		0.0474	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-214	0.604		0.115	0.131		0.0461	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Potassium-40	11.3		1.79	2.14		0.293	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Protactinium-231	0.690	U	2.09	2.09		2.29	pCi/g	07/11/18 17:39	08/02/18 15:46	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S002

Lab Sample ID: 160-29411-2

Date Collected: 07/05/18 13:47

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.600		0.155	0.167	0.700	0.0473	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Radium-228	0.653		0.209	0.220		0.0390	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thallium-208	0.254		0.0740	0.0786		0.0242	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-228	0.541		0.108	0.129		0.0474	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-232	0.653		0.209	0.220		0.0390	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-234	0.953		0.623	0.631		0.886	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-235	-0.298	U	0.347	0.349		0.536	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-238	0.953		0.623	0.631		0.886	pCi/g	07/11/18 17:39	08/02/18 15:46	1

Client Sample ID: PE2-RSYA3-U11-S003

Lab Sample ID: 160-29411-3

Date Collected: 07/05/18 13:48

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.492		0.166	0.174		0.0795	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Actinium-227	-0.326	U	0.712	0.713		0.572	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Bismuth-212	-0.285	U	0.790	0.791		0.630	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Bismuth-214	0.622		0.119	0.136		0.0343	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Cesium-137	-0.0408	U	0.0694	0.0696	0.0700	0.0529	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Cobalt-60	-0.00439	U	0.0194	0.0194	0.200	0.0410	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-210	1.17		0.735	0.748		0.422	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-212	0.543		0.0892	0.114		0.0368	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-214	0.430		0.0960	0.106		0.0461	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Potassium-40	10.9		1.40	1.79		0.270	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Protactinium-231	-0.834	U	2.70	2.70		2.20	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Radium-226	0.622		0.119	0.136	0.700	0.0343	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Radium-228	0.492		0.166	0.174		0.0795	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thallium-208	0.164		0.0491	0.0519		0.0165	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-228	0.543		0.0892	0.114		0.0368	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-232	0.492		0.166	0.174		0.0795	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-234	-0.325	U	1.34	1.34		1.09	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Uranium-235	0.0783	U	0.203	0.203		0.365	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Uranium-238	-0.325	U	1.34	1.34		1.09	pCi/g	07/11/18 17:39	08/02/18 15:45	1

Client Sample ID: PE2-RSYA3-U11-S004

Lab Sample ID: 160-29411-4

Date Collected: 07/05/18 13:50

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.438		0.400	0.403		0.195	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Actinium-227	-0.359	U	0.958	0.959		0.774	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Bismuth-212	-0.308	U	0.985	0.986		0.788	pCi/g	07/11/18 17:39	08/02/18 15:47	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S004

Lab Sample ID: 160-29411-4

Date Collected: 07/05/18 13:50

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.463		0.202	0.207		0.0894	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Cesium-137	-0.0305	U	0.0815	0.0816	0.0700	0.0648	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Cobalt-60	-0.0181	U	0.0882	0.0882	0.200	0.0427	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Lead-210	0.892	U	1.39	1.39		0.999	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Lead-212	0.433		0.0963	0.106		0.0456	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Lead-214	0.545		0.148	0.158		0.0632	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Potassium-40	12.8		1.68	2.12		0.128	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Protactinium-231	0.734	U	2.20	2.21		2.41	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Radium-226	0.463		0.202	0.207	0.700	0.0894	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Radium-228	0.438		0.400	0.403		0.195	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Thallium-208	0.271		0.0688	0.0741		0.0164	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Thorium-228	0.433		0.0963	0.106		0.0456	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Thorium-232	0.438		0.400	0.403		0.195	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Thorium-234	0.773		0.547	0.554		0.764	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Uranium-235	0.0185	U	0.0893	0.0894		0.545	pCi/g	07/11/18 17:39	08/02/18 15:47	1
Uranium-238	0.773		0.547	0.554		0.764	pCi/g	07/11/18 17:39	08/02/18 15:47	1

Client Sample ID: PE2-RSYA3-U11-S005

Lab Sample ID: 160-29411-5

Date Collected: 07/05/18 13:52

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.528		0.160	0.168		0.0319	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Actinium-227	-0.00475	U	0.518	0.518		0.408	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Bismuth-212	0.197	U	0.632	0.632		0.497	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Bismuth-214	0.407		0.141	0.148		0.0603	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Cesium-137	0.000	U	0.0176	0.0176	0.0700	0.0435	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Cobalt-60	0.0127	U	0.0388	0.0389	0.200	0.0297	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-210	0.749		1.09	1.10		0.717	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-212	0.439		0.0933	0.109		0.0459	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Lead-214	0.403		0.120	0.127		0.0514	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Potassium-40	8.41		1.39	1.63		0.241	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Protactinium-231	0.666	U	2.17	2.17		1.75	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Radium-226	0.407		0.141	0.148	0.700	0.0603	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Radium-228	0.528		0.160	0.168		0.0319	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thallium-208	0.133		0.0454	0.0475		0.0140	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-228	0.439		0.0933	0.109		0.0459	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-232	0.528		0.160	0.168		0.0319	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Thorium-234	0.838		0.994	0.998		0.666	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Uranium-235	-0.157	U	0.247	0.248		0.314	pCi/g	07/11/18 17:39	08/02/18 15:44	1
Uranium-238	0.838		0.994	0.998		0.666	pCi/g	07/11/18 17:39	08/02/18 15:44	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S006

Lab Sample ID: 160-29411-6

Date Collected: 07/05/18 13:53

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.397		0.181	0.186		0.151	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Actinium-227	0.342	U	0.803	0.804		0.644	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Bismuth-212	-0.345	U	1.01	1.01		0.798	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Bismuth-214	0.755		0.178	0.194		0.0568	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Cesium-137	0.0223	U	0.0464	0.0465	0.0700	0.0346	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Cobalt-60	-0.00933	U	0.124	0.124	0.200	0.0366	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-210	0.696	U	1.60	1.60		1.27	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-212	0.498		0.107	0.125		0.0507	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Lead-214	0.780		0.159	0.178		0.0617	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Potassium-40	11.0		1.77	2.10		0.255	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Protactinium-231	0.798	U	2.39	2.39		2.60	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Radium-226	0.755		0.178	0.194	0.700	0.0568	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Radium-228	0.397		0.181	0.186		0.151	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thallium-208	0.205		0.0570	0.0608		0.00921	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-228	0.498		0.107	0.125		0.0507	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-232	0.397		0.181	0.186		0.151	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Thorium-234	1.20		1.00	1.01		0.737	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Uranium-235	-0.242	U	0.335	0.335		0.574	pCi/g	07/11/18 17:39	08/02/18 15:45	1
Uranium-238	1.20		1.00	1.01		0.737	pCi/g	07/11/18 17:39	08/02/18 15:45	1

Client Sample ID: PE2-RSYA3-U11-S007

Lab Sample ID: 160-29411-7

Date Collected: 07/05/18 13:55

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.742		0.206	0.219		0.0513	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Actinium-227	0.305	U	0.692	0.693		0.464	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-212	-0.0218	U	0.758	0.758		0.622	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-214	0.707		0.160	0.176		0.0550	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cesium-137	0.0264	U	0.0525	0.0526	0.0700	0.0401	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cobalt-60	-0.0644	U	0.116	0.116	0.200	0.0562	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-210	1.75		1.84	1.85		1.11	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-212	0.549		0.109	0.130		0.0544	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-214	0.497		0.115	0.127		0.0551	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Potassium-40	10.3		1.53	1.86		0.345	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Protactinium-231	0.000	U	0.569	0.569		2.15	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Radium-226	0.707		0.160	0.176	0.700	0.0550	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Radium-228	0.742		0.206	0.219		0.0513	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thallium-208	0.204		0.0646	0.0680		0.0257	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-228	0.549		0.109	0.130		0.0544	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-232	0.742		0.206	0.219		0.0513	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-234	1.93		0.904	0.927		0.602	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-235	0.0868	U	0.370	0.370		0.300	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-238	1.93		0.904	0.927		0.602	pCi/g	07/11/18 17:39	08/02/18 15:46	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S008

Lab Sample ID: 160-29411-8

Date Collected: 07/05/18 13:56

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.510		0.183	0.190		0.0383	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Actinium-227	-0.455	U	1.20	1.20		0.973	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-212	0.299	U	0.789	0.790		0.616	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Bismuth-214	0.792		0.178	0.195		0.0563	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cesium-137	-0.0469	U	0.108	0.108	0.0700	0.0858	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Cobalt-60	0.0106	U	0.102	0.102	0.200	0.0499	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-210	2.57		2.03	2.06		1.22	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-212	0.518		0.119	0.131		0.0630	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Lead-214	0.751		0.141	0.160		0.0656	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Potassium-40	10.5		1.73	2.03		0.426	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Protactinium-231	0.000	U	1.32	1.32		2.96	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Radium-226	0.792		0.178	0.195	0.700	0.0563	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Radium-228	0.510		0.183	0.190		0.0383	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thallium-208	0.207		0.0579	0.0616		0.00944	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-228	0.518		0.119	0.131		0.0630	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-232	0.510		0.183	0.190		0.0383	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Thorium-234	0.486	U	0.516	0.519		1.40	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-235	-0.0725	U	0.477	0.477		0.587	pCi/g	07/11/18 17:39	08/02/18 15:46	1
Uranium-238	0.486	U	0.516	0.519		1.40	pCi/g	07/11/18 17:39	08/02/18 15:46	1

Client Sample ID: PE2-RSYA3-U11-S009

Lab Sample ID: 160-29411-9

Date Collected: 07/05/18 13:58

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.655		0.201	0.212		0.101	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Actinium-227	-0.182	U	0.609	0.610		0.542	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Bismuth-212	-0.601	U	1.19	1.19		0.928	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Bismuth-214	0.406		0.136	0.142		0.0490	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Cesium-137	-0.0119	U	0.0691	0.0691	0.0700	0.0578	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Cobalt-60	0.0471		0.0884	0.0885	0.200	0.0415	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Lead-210	1.09		1.29	1.30		0.828	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Lead-212	0.480		0.103	0.121		0.0425	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Lead-214	0.482		0.123	0.133		0.0623	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Potassium-40	9.97		1.79	2.06		0.332	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Protactinium-231	-0.867	U	2.98	2.98		2.41	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Radium-226	0.406		0.136	0.142	0.700	0.0490	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Radium-228	0.655		0.201	0.212		0.101	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Thallium-208	0.193		0.0717	0.0745		0.0236	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Thorium-228	0.480		0.103	0.121		0.0425	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Thorium-232	0.655		0.201	0.212		0.101	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Thorium-234	0.715	U	1.19	1.20		0.763	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Uranium-235	0.154	U	0.292	0.292		0.248	pCi/g	07/11/18 17:39	08/02/18 16:29	1
Uranium-238	0.715	U	1.19	1.20		0.763	pCi/g	07/11/18 17:39	08/02/18 16:29	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S010

Lab Sample ID: 160-29411-10

Date Collected: 07/05/18 13:59

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.617		0.137	0.151		0.0448	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Actinium-227	0.304	U	0.652	0.653		0.523	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Bismuth-212	-0.371	U	0.726	0.727		0.569	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Bismuth-214	0.415		0.107	0.116		0.0398	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Cesium-137	-0.00189	U	0.0625	0.0625	0.0700	0.0371	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Cobalt-60	0.0162	U	0.0482	0.0482	0.200	0.0229	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Lead-210	-0.540	U	1.61	1.61		1.30	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Lead-212	0.383		0.128	0.138		0.0921	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Lead-214	0.421		0.0817	0.0927		0.0437	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Potassium-40	10.2		1.33	1.69		0.257	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Protactinium-231	0.000	U	0.226	0.226		1.94	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Radium-226	0.415		0.107	0.116	0.700	0.0398	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Radium-228	0.617		0.137	0.151		0.0448	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Thallium-208	0.170		0.0562	0.0589		0.0207	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Thorium-228	0.383		0.128	0.138		0.0921	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Thorium-232	0.617		0.137	0.151		0.0448	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Thorium-234	-0.661	U	1.39	1.40		1.13	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Uranium-235	0.120	U	0.331	0.331		0.314	pCi/g	07/11/18 17:39	08/02/18 16:32	1
Uranium-238	-0.661	U	1.39	1.40		1.13	pCi/g	07/11/18 17:39	08/02/18 16:32	1

Client Sample ID: PE2-RSYA3-U11-S011

Lab Sample ID: 160-29411-11

Date Collected: 07/05/18 14:01

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	0.116		0.0649	0.0654	0.331	0.0432	pCi/g	07/16/18 13:23	08/02/18 05:37	1
Carrier	%Yield	Qualifier	Limits				Prepared	Analyzed	Dil Fac	
Sr Carrier	90.9		40 - 110				07/16/18 13:23	08/02/18 05:37	1	

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.391		0.213	0.216		0.0783	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Actinium-227	0.00294	U	1.02	1.02		0.844	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Bismuth-212	0.517	U	0.865	0.867		0.663	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Bismuth-214	0.710		0.180	0.194		0.0688	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cesium-137	0.00406	U	0.0757	0.0757	0.0700	0.0620	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cobalt-60	-0.0790	U	0.136	0.136	0.200	0.0641	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-210	1.56		1.57	1.58		1.19	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-212	0.545		0.115	0.128		0.0579	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-214	0.564		0.127	0.139		0.0651	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Potassium-40	12.1		1.68	2.07		0.136	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Protactinium-231	-1.06	U	3.66	3.66		2.98	pCi/g	07/11/18 17:39	08/02/18 16:33	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S011

Lab Sample ID: 160-29411-11

Date Collected: 07/05/18 14:01

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Radium-226	0.710		0.180	0.194	0.700	0.0688	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Radium-228	0.391		0.213	0.216		0.0783	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thallium-208	0.200		0.0584	0.0619		0.0133	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-228	0.545		0.115	0.128		0.0579	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-232	0.391		0.213	0.216		0.0783	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-234	-0.122	U	1.67	1.67		1.12	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-235	-0.0436	U	0.117	0.117		0.271	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-238	-0.122	U	1.67	1.67		1.12	pCi/g	07/11/18 17:39	08/02/18 16:33	1

Client Sample ID: PE2-RSYA3-U11-S012

Lab Sample ID: 160-29411-12

Date Collected: 07/05/18 14:02

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.547		0.237	0.244		0.0802	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Actinium-227	-0.0295	U	0.494	0.494		0.504	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Bismuth-212	-0.334	U	0.887	0.888		0.819	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Bismuth-214	0.521		0.155	0.164		0.0740	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Cesium-137	0.0437	U	0.0865	0.0866	0.0700	0.0677	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Cobalt-60	-0.0308	U	0.139	0.139	0.200	0.0485	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Lead-210	0.695	U	1.62	1.62		1.12	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Lead-212	0.493		0.104	0.122		0.0489	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Lead-214	0.378		0.179	0.183		0.125	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Potassium-40	12.4		1.81	2.21		0.281	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Protactinium-231	-0.0000002	U	2.77	2.77		2.28	pCi/g	07/11/18 17:39	08/02/18 16:31	1
	54									
Radium-226	0.521		0.155	0.164	0.700	0.0740	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Radium-228	0.547		0.237	0.244		0.0802	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Thallium-208	0.168		0.0624	0.0648		0.0252	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Thorium-228	0.493		0.104	0.122		0.0489	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Thorium-232	0.547		0.237	0.244		0.0802	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Thorium-234	-1.30	U	0.901	0.911		1.31	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Uranium-235	-0.0159	U	0.449	0.449		0.342	pCi/g	07/11/18 17:39	08/02/18 16:31	1
Uranium-238	-1.30	U	0.901	0.911		1.31	pCi/g	07/11/18 17:39	08/02/18 16:31	1

Client Sample ID: PE2-RSYA3-U11-S013

Lab Sample ID: 160-29411-13

Date Collected: 07/05/18 14:04

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.340		0.218	0.220		0.0893	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Actinium-227	-0.420	U	1.02	1.02		0.819	pCi/g	07/11/18 17:39	08/02/18 16:33	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S013

Lab Sample ID: 160-29411-13

Date Collected: 07/05/18 14:04

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Bismuth-212	0.408	U	0.873	0.874		0.676	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Bismuth-214	0.658		0.186	0.198		0.0725	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cesium-137	0.0155	U	0.0789	0.0789	0.0700	0.0635	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cobalt-60	-0.0419	U	0.129	0.129	0.200	0.0646	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-210	2.46		1.21	1.25		0.719	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-212	0.514		0.118	0.135		0.0619	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-214	0.729		0.174	0.190		0.0576	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Potassium-40	11.3		1.81	2.15		0.261	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Protactinium-231	0.000	U	0.717	0.717		2.72	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Radium-226	0.658		0.186	0.198	0.700	0.0725	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Radium-228	0.340		0.218	0.220		0.0893	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thallium-208	0.244		0.0798	0.0837		0.0261	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-228	0.514		0.118	0.135		0.0619	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-232	0.340		0.218	0.220		0.0893	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-234	0.339	U	1.74	1.75		1.42	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-235	0.122	U	0.240	0.241		0.487	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-238	0.339	U	1.74	1.75		1.42	pCi/g	07/11/18 17:39	08/02/18 16:33	1

Client Sample ID: PE2-RSYA3-U11-S014

Lab Sample ID: 160-29411-14

Date Collected: 07/05/18 14:05

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.497		0.137	0.146		0.0765	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Actinium-227	0.191	U	0.430	0.431		0.462	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Bismuth-212	0.000	U	0.553	0.553		0.588	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Bismuth-214	0.562		0.149	0.160		0.0544	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Cesium-137	0.00389	U	0.0635	0.0635	0.0700	0.0519	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Cobalt-60	-0.00190	U	0.0128	0.0128	0.200	0.0380	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Lead-210	0.215	U	1.69	1.69		1.20	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Lead-212	0.462		0.103	0.119		0.0554	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Lead-214	0.505		0.122	0.133		0.0587	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Potassium-40	9.55		1.44	1.74		0.330	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Protactinium-231	-0.791	U	2.85	2.85		2.32	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Radium-226	0.562		0.149	0.160	0.700	0.0544	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Radium-228	0.497		0.137	0.146		0.0765	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Thallium-208	0.158		0.0553	0.0577		0.0238	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Thorium-228	0.462		0.103	0.119		0.0554	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Thorium-232	0.497		0.137	0.146		0.0765	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Thorium-234	0.580	U	1.02	1.02		0.799	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Uranium-235	-0.198	U	0.385	0.386		0.294	pCi/g	07/11/18 17:39	08/02/18 16:34	1
Uranium-238	0.580	U	1.02	1.02		0.799	pCi/g	07/11/18 17:39	08/02/18 16:34	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S015

Lab Sample ID: 160-29411-15

Date Collected: 07/05/18 14:07

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.827		0.217	0.233		0.0790	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Actinium-227	0.344	U	1.02	1.02		0.824	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Bismuth-212	0.0644	U	1.04	1.04		0.848	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Bismuth-214	0.198		0.139	0.141		0.187	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cesium-137	-0.0279	U	0.0920	0.0921	0.0700	0.0735	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Cobalt-60	-0.0335	U	0.133	0.133	0.200	0.0644	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-210	2.59		2.17	2.20		1.28	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-212	0.443		0.116	0.125		0.0640	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Lead-214	0.503		0.133	0.143		0.0563	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Potassium-40	11.6		1.86	2.20		0.448	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Protactinium-231	-0.904	U	3.69	3.69		3.01	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Radium-226	0.198		0.139	0.141	0.700	0.187	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Radium-228	0.827		0.217	0.233		0.0790	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thallium-208	0.255		0.0729	0.0773		0.0177	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-228	0.443		0.116	0.125		0.0640	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-232	0.827		0.217	0.233		0.0790	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Thorium-234	0.0141	U	1.97	1.97		1.62	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-235	-0.0763	U	0.673	0.673		0.555	pCi/g	07/11/18 17:39	08/02/18 16:33	1
Uranium-238	0.0141	U	1.97	1.97		1.62	pCi/g	07/11/18 17:39	08/02/18 16:33	1

Client Sample ID: PE2-RSYA3-U11-S016

Lab Sample ID: 160-29411-16

Date Collected: 07/05/18 14:08

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.549		0.234	0.241		0.184	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Actinium-227	0.111	U	0.308	0.308		0.472	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Bismuth-212	-0.728	U	1.25	1.25		0.963	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Bismuth-214	0.458		0.168	0.175		0.0679	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Cesium-137	-0.0176	U	0.0850	0.0851	0.0700	0.0714	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Cobalt-60	0.00356	U	0.0884	0.0884	0.200	0.0455	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Lead-210	1.30		1.37	1.38		0.831	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Lead-212	0.469		0.118	0.132		0.0597	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Lead-214	0.484		0.129	0.139		0.0683	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Potassium-40	8.67		1.76	1.97		0.365	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Protactinium-231	0.000	U	0.911	0.911		2.53	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Radium-226	0.458		0.168	0.175	0.700	0.0679	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Radium-228	0.549		0.234	0.241		0.184	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Thallium-208	0.215		0.0820	0.0850		0.0290	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Thorium-228	0.469		0.118	0.132		0.0597	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Thorium-232	0.549		0.234	0.241		0.184	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Thorium-234	-1.01	U	1.16	1.17		1.23	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Uranium-235	0.0421	U	0.188	0.188		0.363	pCi/g	07/11/18 17:39	08/02/18 17:13	1
Uranium-238	-1.01	U	1.16	1.17		1.23	pCi/g	07/11/18 17:39	08/02/18 17:13	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Client Sample ID: PE2-RSYA3-U11-S017

Lab Sample ID: 160-29411-17

Date Collected: 07/05/18 14:10

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.511		0.184	0.192		0.102	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Actinium-227	0.0714	U	0.506	0.507		0.676	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Bismuth-212	0.147	U	0.901	0.901		0.729	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Bismuth-214	0.493		0.118	0.129		0.0279	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Cesium-137	-0.0114	U	0.0609	0.0609	0.0700	0.0509	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Cobalt-60	0.0422		0.0418	0.0420	0.200	0.0222	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-210	-0.328	U	0.736	0.737		1.17	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-212	0.548		0.0989	0.122		0.0416	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-214	0.487		0.106	0.118		0.0481	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Potassium-40	10.2		1.58	1.90		0.252	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Protactinium-231	0.000	U	0.956	0.956		2.24	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Radium-226	0.493		0.118	0.129	0.700	0.0279	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Radium-228	0.511		0.184	0.192		0.102	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thallium-208	0.186		0.0536	0.0570		0.0145	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-228	0.548		0.0989	0.122		0.0416	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-232	0.511		0.184	0.192		0.102	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-234	0.0737	U	0.130	0.130		1.09	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Uranium-235	0.0850	U	0.249	0.249		0.241	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Uranium-238	0.0737	U	0.130	0.130		1.09	pCi/g	07/11/18 17:39	08/02/18 17:14	1

Client Sample ID: PE2-RSYA3-U11-S018

Lab Sample ID: 160-29411-18

Date Collected: 07/05/18 14:11

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.574		0.151	0.162		0.0237	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Actinium-227	-0.382	U	0.789	0.790		0.635	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Bismuth-212	0.318	U	0.565	0.566		0.434	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Bismuth-214	0.517		0.114	0.126		0.0390	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Cesium-137	0.0149	U	0.0642	0.0642	0.0700	0.0518	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Cobalt-60	0.0381		0.0208	0.0212	0.200	0.0227	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-210	0.217	U	1.26	1.26		1.03	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-212	0.396		0.0803	0.0952		0.0398	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Lead-214	0.561		0.114	0.128		0.0363	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Potassium-40	11.0		1.37	1.77		0.255	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Protactinium-231	0.288	U	2.35	2.35		1.93	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Radium-226	0.517		0.114	0.126	0.700	0.0390	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Radium-228	0.574		0.151	0.162		0.0237	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thallium-208	0.180		0.0554	0.0584		0.0200	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-228	0.396		0.0803	0.0952		0.0398	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-232	0.574		0.151	0.162		0.0237	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Thorium-234	0.671		0.370	0.377		0.483	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Uranium-235	0.0450	U	0.412	0.412		0.338	pCi/g	07/11/18 17:39	08/02/18 17:14	1
Uranium-238	0.671		0.370	0.377		0.483	pCi/g	07/11/18 17:39	08/02/18 17:14	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-375997/22-A
Matrix: Solid
Analysis Batch: 380120

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375997

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.02741	U	0.0701	0.0701	0.331	0.0556	pCi/g	07/16/18 13:23	08/03/18 05:52	1
Carrier	MB MB		Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	%Yield	Qualifier	Limits							
Sr Carrier	90.1		40 - 110		07/16/18 13:23	08/03/18 05:52	1			

Lab Sample ID: LCS 160-375997/1-A
Matrix: Solid
Analysis Batch: 379945

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375997

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Total Beta Strontium	8.21	8.560		0.685	0.331	0.0493	pCi/g	104	75 - 125
Carrier	LCS LCS		Limits		Prepared	Analyzed	Dil Fac		
Sr Carrier	%Yield	Qualifier	Limits						
Sr Carrier	88.9		40 - 110						

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-375033/1-A
Matrix: Solid
Analysis Batch: 379770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 375033

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.1009		0.0902	0.0908		0.0470	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Actinium-227	-0.2892	U	0.818	0.819		0.657	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Bismuth-212	0.02134	U	0.596	0.596		0.487	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Bismuth-214	-0.1633	U	0.131	0.132		0.263	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Cesium-137	0.0000	U	0.0257	0.0257	0.0700	0.0405	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Cobalt-60	0.04040		0.0369	0.0371	0.200	0.0190	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Lead-210	-0.3604	U	1.55	1.55		1.29	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Lead-212	0.04053	U	0.0811	0.0813		0.0618	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Lead-214	0.01902	U	0.0960	0.0961		0.0768	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Potassium-40	0.2052	U	0.468	0.468		0.307	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Protactinium-231	0.0000	U	0.234	0.234		2.53	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Radium-226	-0.1633	U	0.131	0.132	0.700	0.263	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Radium-228	0.1009		0.0902	0.0908		0.0470	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Thallium-208	0.01685	U	0.0316	0.0317		0.0327	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Thorium-228	0.04053	U	0.0811	0.0813		0.0618	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Thorium-232	0.1009		0.0902	0.0908		0.0470	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Thorium-234	0.03045	U	1.23	1.23		0.997	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Uranium-235	0.03809	U	0.135	0.135		0.327	pCi/g	07/11/18 17:39	08/02/18 15:09	1
Uranium-238	0.03045	U	1.23	1.23		0.997	pCi/g	07/11/18 17:39	08/02/18 15:09	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-375033/2-A
Matrix: Solid
Analysis Batch: 379771

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 375033

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	95.81		10.1		0.561	pCi/g	99	87 - 116
Cesium-137	28.2	28.06		2.99	0.0700	0.101	pCi/g	99	87 - 120
Cobalt-60	12.9	12.61		1.32	0.200	0.0394	pCi/g	98	87 - 115

Lab Sample ID: 160-29411-1 DU
Matrix: Solid
Analysis Batch: 379774

Client Sample ID: PE2-RSYA3-U11-S001
Prep Type: Total/NA
Prep Batch: 375033

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.412		0.4978		0.167		0.0620	pCi/g	0.18	1
Actinium-227	-0.300	U	0.3214	U	0.868		0.529	pCi/g	0.45	1
Bismuth-212	-0.764	U	0.3569	U	0.785		0.605	pCi/g	0.51	1
Bismuth-214	0.501		0.4218		0.136		0.0433	pCi/g	0.28	1
Cesium-137	0.00854	U	0.01803	U	0.0827	0.0700	0.0662	pCi/g	0.06	1
Cobalt-60	-0.0415	U	0.006275	U	0.0767	0.200	0.0433	pCi/g	0.31	1
Lead-210	-0.862	U	-0.04612	U	1.58		1.30	pCi/g	0.30	1
Lead-212	0.511		0.3870		0.117		0.0605	pCi/g	0.51	1
Lead-214	0.549		0.3882		0.130		0.0511	pCi/g	0.53	1
Potassium-40	10.0		11.20		2.10		0.285	pCi/g	0.29	1
Protactinium-231	0.956	U	0.0000	U	0.421		2.47	pCi/g	0.28	1
Radium-226	0.501		0.4218		0.136	0.700	0.0433	pCi/g	0.28	1
Radium-228	0.412		0.4978		0.167		0.0620	pCi/g	0.18	1
Thallium-208	0.226		0.1920		0.0753		0.0252	pCi/g	0.23	1
Thorium-228	0.511		0.3870		0.117		0.0605	pCi/g	0.51	1
Thorium-232	0.412		0.4978		0.167		0.0620	pCi/g	0.18	1
Thorium-234	1.70		0.3703	U	0.298		1.31	pCi/g	0.72	1
Uranium-235	-0.00745	U	-0.1022	U	0.383		0.264	pCi/g	0.24	1
Uranium-238	1.70		0.3703	U	0.298		1.31	pCi/g	0.72	1

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Rad

Leach Batch: 374774

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29411-1	PE2-RSYA3-U11-S001	Total/NA	Solid	Dry and Grind	
160-29411-2	PE2-RSYA3-U11-S002	Total/NA	Solid	Dry and Grind	
160-29411-3	PE2-RSYA3-U11-S003	Total/NA	Solid	Dry and Grind	
160-29411-4	PE2-RSYA3-U11-S004	Total/NA	Solid	Dry and Grind	
160-29411-5	PE2-RSYA3-U11-S005	Total/NA	Solid	Dry and Grind	
160-29411-6	PE2-RSYA3-U11-S006	Total/NA	Solid	Dry and Grind	
160-29411-7	PE2-RSYA3-U11-S007	Total/NA	Solid	Dry and Grind	
160-29411-8	PE2-RSYA3-U11-S008	Total/NA	Solid	Dry and Grind	
160-29411-9	PE2-RSYA3-U11-S009	Total/NA	Solid	Dry and Grind	
160-29411-10	PE2-RSYA3-U11-S010	Total/NA	Solid	Dry and Grind	
160-29411-11	PE2-RSYA3-U11-S011	Total/NA	Solid	Dry and Grind	
160-29411-12	PE2-RSYA3-U11-S012	Total/NA	Solid	Dry and Grind	
160-29411-13	PE2-RSYA3-U11-S013	Total/NA	Solid	Dry and Grind	
160-29411-14	PE2-RSYA3-U11-S014	Total/NA	Solid	Dry and Grind	
160-29411-15	PE2-RSYA3-U11-S015	Total/NA	Solid	Dry and Grind	
160-29411-16	PE2-RSYA3-U11-S016	Total/NA	Solid	Dry and Grind	
160-29411-17	PE2-RSYA3-U11-S017	Total/NA	Solid	Dry and Grind	
160-29411-18	PE2-RSYA3-U11-S018	Total/NA	Solid	Dry and Grind	
160-29411-1 DU	PE2-RSYA3-U11-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 375033

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29411-1	PE2-RSYA3-U11-S001	Total/NA	Solid	Fill_Geo-21	374774
160-29411-2	PE2-RSYA3-U11-S002	Total/NA	Solid	Fill_Geo-21	374774
160-29411-3	PE2-RSYA3-U11-S003	Total/NA	Solid	Fill_Geo-21	374774
160-29411-4	PE2-RSYA3-U11-S004	Total/NA	Solid	Fill_Geo-21	374774
160-29411-5	PE2-RSYA3-U11-S005	Total/NA	Solid	Fill_Geo-21	374774
160-29411-6	PE2-RSYA3-U11-S006	Total/NA	Solid	Fill_Geo-21	374774
160-29411-7	PE2-RSYA3-U11-S007	Total/NA	Solid	Fill_Geo-21	374774
160-29411-8	PE2-RSYA3-U11-S008	Total/NA	Solid	Fill_Geo-21	374774
160-29411-9	PE2-RSYA3-U11-S009	Total/NA	Solid	Fill_Geo-21	374774
160-29411-10	PE2-RSYA3-U11-S010	Total/NA	Solid	Fill_Geo-21	374774
160-29411-11	PE2-RSYA3-U11-S011	Total/NA	Solid	Fill_Geo-21	374774
160-29411-12	PE2-RSYA3-U11-S012	Total/NA	Solid	Fill_Geo-21	374774
160-29411-13	PE2-RSYA3-U11-S013	Total/NA	Solid	Fill_Geo-21	374774
160-29411-14	PE2-RSYA3-U11-S014	Total/NA	Solid	Fill_Geo-21	374774
160-29411-15	PE2-RSYA3-U11-S015	Total/NA	Solid	Fill_Geo-21	374774
160-29411-16	PE2-RSYA3-U11-S016	Total/NA	Solid	Fill_Geo-21	374774
160-29411-17	PE2-RSYA3-U11-S017	Total/NA	Solid	Fill_Geo-21	374774
160-29411-18	PE2-RSYA3-U11-S018	Total/NA	Solid	Fill_Geo-21	374774
MB 160-375033/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-375033/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29411-1 DU	PE2-RSYA3-U11-S001	Total/NA	Solid	Fill_Geo-21	374774

Prep Batch: 375997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29411-1	PE2-RSYA3-U11-S001	Total/NA	Solid	DPS-0	374774
160-29411-11	PE2-RSYA3-U11-S011	Total/NA	Solid	DPS-0	374774
MB 160-375997/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-375997/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29411-2

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)
160-29411-1	PE2-RSYA3-U11-S001	88.8
160-29411-11	PE2-RSYA3-U11-S011	90.9
LCS 160-375997/1-A	Lab Control Sample	88.9
MB 160-375997/22-A	Method Blank	90.1

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

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